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THE TEACHER AS MEDIATOR:
SMALL GROUP COGNITIVE INTERACTION IN FINNISH PRESCHOOL AND FIRST GRADE SETTINGS

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DOCTORAL DISSERTATION

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For all learners
and their teachers

ABSTRACT

This study explores small group cognitive interaction, mediation, and teachers' pedagogical thinking about cognitive education drawing upon the Mediated Learning Experience (MLE) theory. It poses two sets of research questions: 1. How do teachers' actions reflect mediation? and 2. How does mediation vary between teachers and over time? and 1. In what ways does teachers' pedagogical thinking reflect aspects of cognitive education and classroom interaction? and 2. In what ways does teachers' pedagogical thinking reflect mediation? The goal is to describe and understand the nature of interaction and teachers' pedagogical thinking.

Research data was collected with video observations and teacher interviews in the capital area of Helsinki, Finland in 2008-2009. Research participants included five preschool teachers, one classroom teacher and four students from each teacher's class. In data analysis Observation of Mediational Interaction (OMI) instrument by Klein, Wieder & Greenspan (1987) and Leiwo, Kuusinen, Nykänen & Pöyhönen (1987a, 1987b) linguistic interaction and discourse interaction model were applied.

Teachers' actions reflected mediation in intentionality, reciprocity, meaning, transcendence, feeling of competence and regulation and control of behavior which were accompanied by resource management. Mediation varied between teachers and over time. Provision of meaning (32.98%) characterized the interaction in all but one teacher's account. Mediation for transcendence appeared the least (0.45%) in all interaction. Teachers' pedagogical thinking supported cognitive education but appeared unsystematic and partial in describing some of its dimensions. The implications of the study and future work are discussed.

Keywords: cognitive interaction, mediated learning experience (MLE), cognitive functions, pedagogical thinking, preschool, primary school

TIIVISTELMÄ

Tässä tutkimuksessa selvitetään pienryhmässä tapahtuvaa kognitiivista vuorovaikutusta ja opettajan pedagogista ajattelua kognitiivisesta kasvatuksesta. Tutkimus pohjautuu ohjatun oppimiskokemuksen (Mediated Learning Experience, MLE) -teoriaan. Kognitiiviseen vuorovaikutukseen liittyvät tutkimuskysymykset ovat 1. Kuinka ohjaavaa opetus ilmenee opettajan vuorovaikutuksessa? ja 2. Kuinka ohjaava opetus vaihtelee opettajien välillä sekä kouluvuoden aikana? Pedagogiseen ajatteluun liittyvät tutkimuskysymykset ovat 1. Mitä opettajat ajattelevat kognitiivisesta kasvatuksesta ja kognitiivisesta vuorovaikutuksesta? ja 2. Millaisia ohjatun oppimiskokemuksen tekijöitä opettajan pedagogisessa ajattelussa ilmenee?

Tutkimuksen tavoitteena on kuvata ja ymmärtää vuorovaikutuksen ja opettajan pedagogisen ajattelun luonnetta. Tutkimusaineisto kerättiin pääkaupunkiseudulla vuosina 2008-2009. Aineiston hankinnassa käytettiin pienryhmäopetustuokioiden videointia ja opettajahaastatteluja. Tutkittavina oli viisi esikoulun opettajaa ja yksi ensimmäisen luokan opettaja sekä neljä oppilasta kunkin opettajan luokalta. Aineiston analyysissä hyödynnettiin Observation of Mediational Interaction (OMI) instrumenttia (Klein, Wieder & Greenspan (1987) ja Leiwo, Kuusinen, Nykänen & Pöyhönen (1987a, 1987b) linqvistisen vuorovaikutuksen ja diskurssin mallia.

Opettajan vuorovaikutus kuvasti intentionaalisuutta, vastavuoroisuutta, merkitysten rakentamista, siltaamista (transendenssi), pätevyyden tunteen säilyttämistä ja käyttäytymisen säätelyä ja kontrollointia. Näiden lisäksi vuorovaikutus sisälsi resurssien hallintaa. Ohjaavassa opetuksessa esiintyi vaihtelua opettajien välillä sekä kouluvuoden aikana. Vuorovaikutuksessa esiintyi eniten merkityksen antamista (32,98%) kaikkien paitsi yhden opettajan osalta. Siltaamista (transendenssi) ilmeni vuorovaikutuksessa vähiten (0,45%). Opettajien pedagoginen ajattelu tuki kognitiivista kasvatusta, mutta opettajat kuvasivat joitakin kognitiivisen kasvatuksen ulottuvuuksia epäsystemaattisesti ja puutteellisesti.

Hakusanat: kognitiivinen vuorovaikutus, ohjattu oppimiskokemus, kognitiiviset toiminnot, pedagoginen ajattelu, esiopetus, alkuopetus

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1 INTRODUCTION

Thinking skills and learning to learn are attracting increasing attention in education. In Finland, they are considered one of the seven transversal competencies and are integrated into teaching and learning starting from early education. In the preschool context, the prerequisites for learning are integrated into five learning entities: Expression in a multifaceted way, Language-rich world, I and our community, I investigate and act in my environment, and I grow (Esiopetuksen opetussuunnitelman perusteet 2014). Prior to the curriculum renewal in 2014, thinking, motivation and metacognition were integrated into the concept of learning, the description of the learning environment and the methods for teaching the contents of the six content areas of Language and Interaction; Mathematics; Ethics and Religious Education; Environment and Nature Studies; Health, Physical and Motor Development; Art and Culture (Esiopetuksen opetussuunnitelman perusteet 2000). The enhancement of thinking skills and learning to learn in the first grade is in line with preschool education. The precondition factors of learning are considered one of the seven transversal competencies and integrated into Finnish Language and Literature, Mathematics, Environment and Nature Studies, Religion or Ethics, Music, Art, Handicrafts, Physical Education and selectives (Valtioneuvoston asetus 422/2012, section 6). Prior to the national curriculum 2014 learning to learn and thinking skills were introduced in cross-curricular themes particularly in Finnish Language Arts, Math and Environmental Studies and assessed at the end of second grade (Perusopetuksen opetussuunnitelman perusteet 2004).

The main objective of the present study is to investigate teaching and mediated learning experience (MLE) in preschool and first grade small group structured sessions. I examine the classroom interaction between teachers and small groups of students drawing upon the theory of mediated learning experience (MLE). I apply the Observation for Mediational Interaction instrument (Klein, 1987) and the classroom interaction model (Leiwo et al., 1987a, 1987b) to analyze the interaction. Moreover, to advance an understanding of how teachers view classroom interaction from a cognitive perspective, I examine teachers' pedagogical thinking on cognitive education and MLE.

A mediated learning experience is created by a mediator whose intentionality transforms the stimuli, learning organism and the human mediator in a meaningful way into a compatible combination (Feuerstein, 1983; 2003). The actions of the mediator are called mediation. The participants and initiators in mediated interaction can be parents and their children, siblings, caretakers and children and other individuals (Feuerstein 2003, pp. II-IV). Mediated learning experience provides the learner with a capacity to seek for opportunities for learning, to explore

these opportunities and gain in potential to become affected and modified by them. My research interest is in the interaction of teachers who do not have specific training in mediation, as mediated learning may appear in classroom interaction even if teachers are not trained in mediation (Greenberg, Woodside & Brasil, 1994).

Using the MLE theory to examine teacher-student interaction may enlighten the strategies teachers use to support cognitive development of students in a formal educational context. Finnish teachers state that they take development of thinking skills and learning to learn into account in their planning, method selection and teaching (Atjonen et al., 2008). In the study by Atjonen et al. teachers reported the meaning of curriculum objectives influencing their actions on a scale of 1-4 (1 = almost not at all, 2 = somewhat, 3 = a lot and 4 = very much). Primary school teachers stated that the development of students' thinking skills and learning to learn skills greatly influence their planning, selection of teaching and work methods (3). This result creates good possibilities for the development of cognitive functions, but as Atjonen et al. (ibid., p. 107) remark the challenge remains to see how well the good intentions are executed in practice. Furthermore, Finnish preschool teachers evaluate their students to achieve the aims for learning to learn at a medium level (Ojala & Talts, 2007). Preschool teachers rated preschoolers learning to learn skills as among the top six skills out of nine acquired in preschool. The calculated means showed children's learning in health, psychomotor skills, mathematics and social skills being the highest, and learning to learn skills acquired at a similar level as language and interaction skills. However, research knowledge is still scarce regarding the question of how teachers guide students to reach a fine level of performance. We also lack knowledge about how teachers perceive cognitive education and the task of enhancing cognitive functions in teaching. As current national guidelines mandate early education, preschool and basic education to develop thinking skills and learning to learn (Basic Education Act 628/1998, Section 2; Valtioneuvoston asetus 422/2012, section 3; Finnish National Board of Education 2016a; Finnish National Board of Education 2016b) the accountability of educators requires an examination of how the plans are actualized in classroom interactions.

The legacy of Professor Reuven Feuerstein in the field of cognitive development, cognitive assessment and education is that of a trailblazer (Feuerstein, Falik, Feuerstein, Feuerstein & Haywood, 2015, pp. XI-XIV). Many concepts and applications are derivative of the notions of modifiability and mediated learning experience. The two major applied programs, Instrumental Enrichment and Learning Propensity Assessment, are used in many countries, across cultures, languages, ages and settings. Feuerstein specified the nature of the interaction that could facilitate learning in the classrooms and beyond. Feuerstein's theory addresses the question why the ability to learn fails to develop during early childhood. Professor Pnina Klein's research on early childhood education and

infant-adult interactions has set her in a leading position internationally. The More Intelligent and Sensitive Child (MISC) Program (Klein, 2003) relies on the concept of mediation. The program has been applied with young children in many countries worldwide. It has proven effective in improving family interactions and thus the cognitive, psychosocial and emotional development of disadvantaged children.

Next, I discuss the MLE theory, research on teacher-student cognitive interaction in the non-MLE classroom, as well as research on teacher-student interaction in the MLE classroom. After that I introduce research on teachers' pedagogical thinking and discuss it within the MLE theory. My discussion is followed by the presentation of the methods, data handling, analysis and results.

2 COGNITIVE INTERACTION

2.1 Mediated Learning Experience (MLE)

The theory of mediated learning experience (MLE) is based on structural cognitive modifiability and sociocultural theories of development in which cognitive development is seen to occur in social interaction. MLE is defined as a quality of human-environment interaction (*Feuerstein's theory & applied systems* 2003, p. II). The propensity of an individual to change his/her behavior and thinking is attributed to the interaction by a human mediator, an adult or more capable peer, who interposes him/herself between the receiving organism (i.e. the child) and the sources of stimuli (i.e. the tasks the child is trying to solve) (Feuerstein et al., 2015, Feuerstein, 2003). The mediator, who is guided by his intentions, culture, and emotional investment, selects, organizes, schedules the stimuli, changes their amplitude, frequency and saliency and turns them into determinants of behavior instead of randomized stimuli whose occurrence, registration, and effects may be purely probabilistic for the child. Through the process of mediation, the cognitive structure of the child can be affected (Feuerstein, 1983).

Mediation creates a need for learning with a state of awareness and consciousness (Feuerstein et al., 2015). The effect of mediation is the acquisition of a mediated stimulus but also the creation of a disposition, an attitudinal propensity in the mediatees, to benefit from direct learning experiences where the child can apply acquired rules, concepts, and principles in a wide variety of contexts. Thus, in mediation the cognitive, conative and emotional parts of learning are affected. Gestural, kinetic, mimicry, exposure to models of activities and verbal interaction may bear the quality of mediation which is not dependent on the language in which the interaction takes place. Lack of mediated learning experience reflects attitudinal and motivational deficiencies, lack of working habits and learning sets in the input, elaboration and output levels of information processing (Feuerstein et al., 2015, Feuerstein, 2003).

Feuerstein, Klein & Tannenbaum (1991) present 12 parameters for the mediated learning experience: intentionality and reciprocity; transcendence; mediation for meaning; mediation for feeling of competence; mediated regulation and control of behavior; mediated sharing; mediated individuation and psychological differentiation; mediation of goal seeking, goal setting, goal planning and achieving; mediation of challenge; mediation of an awareness of the human as a changing entity; mediation of the search for an optimistic alternative; and mediation of the feeling of belonging. The first three; intentionality and reciprocity, mediation for transcendence and mediation for meaning are considered essential for an

interaction to qualify as mediation creating an MLE. The rest, for example mediation for feeling of competence and mediation for regulation and control of behavior, are reinforcing, task and culture dependent. I choose to examine the interaction with the first five parameters as they have been operationalized and verified in various studies with infants and young children (Tzuriel 1996, 2001, 2002, 2013; Klein, 1988), peer-mediation (Tzuriel & Gaspi, 2017; Shamir & Tzuriel, 2004; Tzuriel & Shamir, 2007, 2010), sibling mediation (Klein, Zarur & Feldman, 2003; Tzuriel & Hannuka-Levy, 2014) and teacher-student mediation (Tzuriel & Remer, 2018). The parameters are defined in the following way:

Intentionality and reciprocity

Intentionality is transformation of an event by the mediator's intentions to make it experienced, observed and perceived by the mediatee. Intentionality produces an alteration in the state of mind of the child, an awareness of what is being done and why. *Reciprocity is turning an implicit intention into an explicit, volitional and conscious act*. Reciprocity is manifested by mutual questioning and answering. Reciprocity enables mediators to adjust mediation according to the child's responses to it. Intentions, together with decisions and promises, are commitments to future actions and are the core of agency (Moya, 1990, p.141).

Transcendence

Transcendence is *orientation of the mediator to widen the interaction beyond the immediate primary and elementary goal*. In cognitive education transcendence, bridging also helps learners to manipulate mental representations of objects, ideas, concepts, rules and possibilities which are generalized to other contents familiar to the learner (Haywood, 2018, 1986). By doing this, the mediator creates in the mediatee a propensity to enlarge his cognitive and affective repertoire of functioning constantly. Transcendence moves the child from the concrete and visible to the abstract and representational (Lidz, 1991). Bridging of functions is cognitively more valuable than bridging of content. For example, when teaching comparison by using geometric figures the teacher may ask: "When else do you need to compare things?" This would be bridging the cognitive function whereas the question "What other things can you think of that are square?" would be bridging the content and would be less valuable for cognitive education (Haywood, 1986). Transcendence is related to teaching as a didactic method for the teacher to enhance cognitive functions and learning. Transfer, on the other hand, refers to learners' acquisition of skills and application (transfer) of them to solve problems (Joyce, Calhoun & Hopkins, 2009). One way to provide transfer could be the use of transcendence.

Mediation for Meaning

Mediators bring out the worth of a stimulus by expressing affect, interest or enthusiasm verbally or nonverbally. Mediation of meaning answers the questions *why, what for* and is about making implicit reasons explicit. Mediation of meaning becomes the generator of the emotional, motivational, attitudinal, and value-oriented behaviors of the individual. Further development and the more complex verbal modalities used for the mediation of meaning create in the mediatee an orientation toward the search for meaning and once internalized, this need becomes the source of independent modes of functioning and decision-making.

Mediation of feeling of competence

Mediation of feeling of competence is interpreting the mastery and the competence of the mediatee and turning it into awareness, feeling and consciousness of one's competence. Mediation of feeling of competence confirms abilities and skills, creates an optimistic belief in success, and empowers confidence and self-reflections on abilities and achievements (Falik, 2000). It is creating in the individual a readiness to go beyond the completed task.

Mediation of regulation and control of behavior

Mediation of regulation and control of behavior is inhibition and initiation of behavior. It accelerates behavior through the orientation of the individual to self-reflection and provides the feedback necessary for decisions bearing upon the appropriateness or inappropriateness of certain behaviors, their timing, rhythm, and suitability to the particular situation.

Cognitive development in social context is addressed in the terms of apprenticeship and guided participation (Rogoff, 1990). The involvement of a companion in the social activity can provide guidance, direction or challenge. A companion can be a support or an impetus for development. Learners are also assisted by highlighting, encouraging, modeling, generalization and play, and by motivating, simplifying tasks, pointing critical features and controlling frustration – all these are examples of scaffolding. The scaffolding process enables a child or novice to solve problems, carry out tasks or achieve goals which would be unreachable without the tutor's support and assistance (Wood, Bruner & Ross, 1976). The term scaffolding was used by Bruner (1983) for the linguistic support given to a learner by an adult in a transactional format with the child. The role of the adult is a matter of "setting up" (Bruner, 1983, p. 60) so that the child can take over when he/she has the aptitude to do so. When the "handing over" takes place the scaffold is removed. Wood, Bruner, and Ross's (1976) idea of scaffolding resembles those of Feuerstein and the concept of mediation. Mediation has been given attributes which have been verified for cognitive development, and in this study, I examine cognitive interaction within the MLE paradigm.

Learning has cognitive, affective and conative dimensions. These dimensions in cognitive functions (Haywood, 1986), executive functions (Diamond, 2013) and learning to learn (Hautamäki et al., 2002; Gustavson, Hautamäki, Kupiainen, Marjanen & Vainikainen, 2010) provide ways to attend to learners' inner processes and systems and affect them. I use the theory of mediated learning experience to focus attention on the responsibility of the acting teacher as a mediator and to focus on the quality aspects of the teaching interaction within the first five defined MLE parameters.

Feuerstein's theory and his techniques have been criticized for being philosophical rather than technically adequate (Frisby and Braden, 1992). Cognitive modifiability, referring to Feuerstein's notion of intelligence being not fixed but modified by individual adaptation and responses to interaction with the environment, has received critique from Frisby and Braden for being too imprecise (Frisby & Braden 1992, p. 4). They state that "With the possible exception of intensive instructional intervention after prolonged and extreme deprivation, no program of instruction alone can "modify" the structure, physiology or biochemistry of the brain to a significant degree" (Frisby and Braden 1992, p. 5). Similar questioning of modifiability has been presented by Kendel, Barres & Hudspeth (2012), who ask how it is possible for behavior to be modified when the nervous system is wired precisely and connections between the signalling units, neurons, are set during early development?

Structural cognitive change is, however, supported by modern findings in the neurosciences, brain research and neuroplasticity (Feuerstein et al., 2015, pp. 84-85). There is now considerable evidence for functional plasticity at chemical synapses, which often have a capacity for short-term physiological changes that increase or decrease synaptic effectiveness (Kendel et. al., 2012, pp. 37-38). Long-term changes can give rise to further physiological changes that lead to anatomical alterations, including the pruning of pre-existing synapses and even the growth of new ones. Sanes & Jessell (2012) state that the plasticity of the nervous system in response to experience endures throughout life. They explain that the embryonic connectivity of the nervous system is refined by sensory stimulation (experiences) after birth. It is the two-part sequence of genetically determined connectivity and experience-dependent reorganization which accounts for the motor, perceptual and cognitive abilities of humans (Sanes & Jessell 2013, p. 1259). Similar conclusions are presented by Hari et al. (2015), who point out that it is due to the plasticity, impulses and functioning of cells that neuro connections change. The environment influences the manifestation of the genetic code through epigenetics mechanisms. Plasticity takes place in the connections of the brain cells, but the cerebral cortex can also change.

2.2 Teacher-student interaction for cognitive development

Aspects of children's thinking include perceptual, language, memory and conceptual development, as well as the development of social cognition, problem solving and academic skills such as mathematics, reading and writing (Siegler & Alibali, 2005). Research on learning with advanced technologies, such as eye tracking and physiological measures, reveal that a major challenge for learners lies in monitoring and controlling key cognitive and metacognitive processes during learning (Azevedo & Aleven, 2013). Teachers can promote students' cognitive processes and learning (Battro et al., 2013) and integrate thinking into educational practices (Salmon, 2010) in several ways. An emotionally positive, structured and cognitively stimulating classroom environment (Vandenbroucke, Split, Verschueren, Piccinin & Baeyens, 2018) has been theoretically and empirically verified for effective teaching to enhance student development and academic learning, which is part of thinking development. The Teaching through Interactions model (Hamre et al., 2013) posits the effect of teacher-student interaction for students' learning and cognitive development. The value of emotional support in kindergarten and primary years is shown by successful adjustment after the transition from kindergarten to first grade (Kiuru et al., 2016), increased peer acceptance (Kiuru et al., 2015) and by academic learning which extends to the future. Strong emotional, organization, and instructional support in kindergarten relates not only to the initial level of children's reading and math skills but high-quality teacher–child interactions in kindergarten are positively associated with more advanced academic skills four years later (Pakarinen et al., 2017; Kiuru et al., 2013). The emotional quality of the teacher-student relationship also demonstrates a protecting feature. Students with high risk of dyslexia are less discriminated in classes where the teacher reported the class climate to be warm and positive compared to other classes (Kiuru et al., 2012). Successful interaction is ensured by teachers' sensitiveness and flexibility. Teachers adapt their interaction in accordance with children's behaviors. In one study, when students in the first grade demonstrated active avoidance of tasks, the teacher in the second grade aimed at creating a positive learning environment and invested in classroom management and supportive guidance (Pakarinen et al., 2014). The pedagogical relationship in early childhood education, professional love, is based on a deep, sustaining, respectful and reciprocal relationship between the teacher and children (Page, 2011). The concept of love contains an ethical content in interaction. It enhances children's good life (Estola & Puroila, 2013). The pedagogical relationship and emotional support rely on characteristics of the children and the relationship between the individual and the teacher. Some children are socially confident and desire direct guidance while children with an innate introvert temperament might prefer indirect interactions with their teachers.

Teachers' organizational support for learning promotes attention and engagement. The higher the quality of organization of the activities, the more interested the children are in the contents (Pakarinen et al., 2010). Fifth graders' show higher levels of observed behavioral engagement in mathematics learning in classes with high organization (Rimm-Kaufman, Baroody, Larsen, Curby & Abry, 2015). The teacher's support for learning as well as the development of good studying habits are central. When children know what is expected of them it is easier for them to respond to the expectations (Gustavson et al., 2011). Classroom organization alone does not predict academic results. A third graders' literacy learning study revealed that both the global quality of the classroom learning environment and the time individual students spent on specific types of literacy instruction covering a specific content interacted to predict students' comprehension and vocabulary gains, whereas neither system alone did (Connor et al., 2014). The importance of time spent on learning is also verified by Vainikainen (2014). In her study, Vainikainen found that girls' advantage over boys in learning to learn from first to sixth grade was explained by girls' more positive attitudes and greater effort as measured by their time investment in the tasks compared to boys. Reduced time investment and higher levels of detrimental attitudes provided a partial explanation why students with identified support needs did not reach their expected level of performance in the sixth-grade assessment. Attention, motivation and time spent on tasks dynamically support learning, which places demands on the teacher's ability to produce learning activities and materials to catch students' attention, motivate them and keep them interested in the tasks. As teacher's knowledge is not transmittable to students directly, teachers need ways to utilize their knowledge with students. Teachers' content knowledge has a significant relationship in students' achievement (Campbell et al., 2014). Flexible use of content and its representations with real life examples and learner-centeredness reflect teachers' positive use of content knowledge with students (Alonzo, Kobarg & Seidel, 2012). Teachers can also use their content knowledge with students indirectly. When the teacher prepares lessons and considers class, student and contextual factors in this planning, the interaction is of an indirect nature (Kansanen, 1999).

In addition to emotional support and high classroom organization, teachers can enhance cognitive development by means of instructional support. Instructional support promotes children's cognitive and higher order thinking and enhances deep learning. In instructional support, teachers use instructional discussions, language-stimulation and language-facilitation techniques, expansion of learning and understanding through quality feedback (Hamre et al., 2013). Teachers can expand learning with real-life examples. Cognitively stimulating environments relate positively to cognitive skills. Students in learning communities where expertise is distributed are capable of deep, sustained, complex thinking both in whole-class discussions and small groups (Brown & Campione, 1994). Students

in classes with a higher overall level of cognitive activation report using more metacognitive strategies (Rieser, Fauth, Decristan, Klieme & Büttner, 2013), and classrooms with a higher level of instructional support report children with higher mathematics achievement, receptive language skills and science knowledge (Hu et al., 2017). Dimensions of instructional support, concept development, quality feedback, language modeling and richness of instructional methods reflect the didactic relationship of teachers and students. Using instructional support, teachers mediate and facilitate students' actions and studying of content. Teaching and studying meet in the didactic relationship (Kansanen & Meri, 1999), which is at the core of a teacher's profession (Kansanen, 2003). Changes in the conceptions of the adult-child interaction and the meaning of peer-relationships for learning change the teacher's practices, which are personal. Nowadays, teachers are faced with continuous development demands as research provides more specific data on learning. For example, understanding neuron connections might help teachers develop teaching techniques which minimize the role of the hippocampus during active learning, so that the working memory can directly access the information (Abiola & Dhindsa, 2012). How a teacher deals with this in the classroom is a didactic matter and requires pedagogical thinking on behalf of the teacher concerned.

In all, cognitive interaction research shows that effective teaching and quality interaction enhance students' prerequisites for learning as well as academic performance. Teaching for cognitive development may take place with special intervention programs where ready-made structured intervention material and instructions on how to implement it leads to student success and satisfaction for the teachers involved (Gardner, Kreschevsky, Sternberg & Okagaki, 1994; Kuusela, 2000; Paananen, Aro, Närhi & Aro, 2017). When the intervention is over and the researchers have gone, teachers are left to continue enhancing cross-curricular competencies, which was the target of the intervention programs. But how do teachers manage this task? The Teaching through Interactions model provides a theoretical and empirical model for examining cognitive interaction in classrooms but does not provide practical help or know-how for teacher practitioners. How do teachers create an emotionally positive climate and how do they demonstrate sensitivity, flexibility and regard for students' perspectives with different students? How do teachers set behavior expectations and student engagement? What actions do teachers take to expand learning and thinking in their classrooms? Research on mediation, which is presented in the next section, opens up aspects of the cognitive interaction in the classroom and provides ways to answer the demand for cognitive stimulation, expansion of learning and assessment of cognitive functions. Mediation research also demonstrates a neglected area in current teacher-student interaction research.

2.3 Teacher-student interaction for mediated learning experiences

When teachers apply MLE theory in classroom their teaching is based on mediation. MLE theory encourages teachers to examine classroom interactions to determine to what extent they are meeting the criteria of mediated learning experiences prescribed by Feuerstein. Mediating teachers elicit evidence of thinking from children by questions directed at the process of learning rather than at answers. Mediation also includes guidance of children to develop tools for learning strategies and methods. For example, mediators teach counting as a cognitive strategy, a way of finding out how many of anything one has, rather than as a procedure for its own sake. Mediation involves accepting the answers given by the children but challenging them and requiring justification and explanation of the process. Mediation is inductive in the sense that it involves asking children to form generalities from successive examples, objects and events. A mediating teacher values and exploits rules and their generalization. Mediation is deductive in that sense, enhancing children's metacognitive functioning (Haywood, 1985).

Mediation is cognitive education which includes learning about thinking and thinking about learning (Haywood, 2000), approaches which enhance cognitive functions. Cognitive functions, *processes of thought,* are required and used in the understanding and learning of a wide range of events, information, facts, relations and content (Haywood, 1986). Haywood defines cognitive functions as standard ways of thinking about or understanding events. According to him, the intellective dimensions of cognitive functions are made up of knowledge, understanding, operations, and strategies for thinking, whereas the nonintellective dimensions of cognitive functions include habits, attitudes, and motives as well as dispositions and the will to do things. Haywood states that cognitive functions may be composed of purely cognitive, affective, attitudinal and volitional components. In assessment, mediators can take advantage of dynamic assessment, which focuses on detecting the learning potential of children and the status of their cognitive functions while mediating them (Tzuriel, 2003). Mediation strategies in dynamic assessment contribute to the cognitive gain of Grade 1 and 2 children (Passig, Tzuriel & Eshel-Kedmi, 2016) so a mediating teacher can enhance development of cognitive functions even when assessing his or her students.

Much of our knowledge on mediation interaction has accumulated from interaction between an informal educator and a child. Studies on parental mediation (Klein et al., 1987; Klein, 1988; Lidz, Bond & Dissinger, 1990; Klein, 1991; Tzuriel, 1996) show that quality interaction is important for the cognitive development of the child starting from infancy, and exposure to such interaction leads to success in intellectual performance at school. For example, early writing is significantly predicted by analogical reasoning above and beyond age and gender

(Tzuriel & Flor-Maduel, 2010). Mothers' cognitive guidance observed during play predicted children's mathematics skills tested at preschool and assessed by teachers at 9th grade (Sorariutta & Silven, 2018). Mother-child interaction has revealed that mediation varies in the amounts, demonstrating increase with children between 6 and 34 months even though mothers are consistent in the amount of mediation they provide (Klein, 1988). Variation in mediation is connected to the socioeconomic level of the mother and to some extent to the nature of the task. The mother's higher socioeconomic status showed in the higher mediation score of the interaction compared to the interaction of low socioeconomic mothers with the greatest difference in the mediation for transcendence (Tzuriel, 1996). The provision of the meaning and feeling of competence appeared higher in a free play than in a structured situation. Tzuriel speculates that the structure of non-free activities might have released mothers from their active mediational role, and they trusted the structured activities to support the learning process of their child. Which might very well be the case. A significant relationship between the parent's provision of transcendence and child's cognitive development has been reported by Klein et al. (1987), Lidz et al. (1990) and Tzuriel (1999) which increases the value of mediation for transcendence and emphasizes the need for an active role by an adult in the learning interaction. The quality of the parent-child interaction has been improved by training for mediation with long-lasting effects (Klein & Alony, 1993).

The varying nature of mediation and the low level of mediation for transcendence (expanding) has also been shown in sibling studies (Klein, Zarur & Feldman, 2003). Furthermore, the mediator's sensitivity, and the awareness and spontaneous need for mediation has come up when older siblings showed a higher level of mediation strategies with a young sibling who had an intellectual disability (Tzuriel & Hanuka-Levy, 2014). An explanation concerning the varying nature of mediation, besides training, might indeed be the varying needs of the mediatees as older siblings' interaction did not show the high levels of mediation when the younger sibling was developing typically. However, significant differences in the amount of mediation in a teacher-student interaction was not found when a teacher was teaching a story in a special education group compared to a group with no special education children (Tzuriel & Remer, 2018). Findings in peer mediation studies and cross-generational transmission of teaching behaviors (Tzuriel & Shamir, 2007; Tzuriel & Caspi, 2017), confirm the value of training for mediation as well as the impact on cognitive development of both the mediators and the mediatees.

Research based on the MLE theory shows that teachers who are trained to implement cognitive intervention programs such as Bright Start and Feuerstein's Instrumental Enrichment, successfully enhance the cognitive functions of students (Brooks & Haywood, 2003; Tan, Seok-Hoon & Woon-Yin Foong, 2005; Salas et al., 2010; Kyrö-Ämmälä, 2007) and rehabilitate children with special needs

(Virmajoki-Tyrväinen, 2005; Kettunen, 2005; Nevalainen, 1998). Training with these programs might also be reflected in the teacher's professional development in cognitive education. Virmajoki-Tyrväinen (2005) found that she was able to improve the quality of her questions by making them more process oriented during the Bright Start intervention in her classroom. Teachers' training effects have been found to include questions facilitating higher levels of mediated learning and greater use of mediation for transcendence compared to teachers without training (Tzuriel, Kaniel, Zeliger, Firedman & Haywood, 1998; Greenberg, Woodside & Brasil, 1994).

The benefits of training for mediation show in the increased mediation quality of the interaction of parents, siblings, peers and teachers. But not all teachers are trained to use cognitive programs or are trained for mediation. Research lacks studies of teachers who by curriculum demand are expected to enhance cognitive functions in a variety of contents. As untrained teachers may demonstrate mediation, and teachers in early childhood education and lower grades in basic education have a wide variety of opportunities to interact with the children, there is a need to examine how these opportunities are used for mediation by teachers who are not applying a cognitive intervention program or who have not received training for it. If the results from earlier research are applicable in the Finnish preschool and first grade context it is possible that some teachers show high levels of mediation while others do not. The possible variation is concerning as the opportunities to benefit from direct teaching and learning situations are less for students whose cognitive functions do not develop to levels where independent learning is optimal. Although care, education and teaching form a whole in Finnish early childhood education, I focus on teaching in structured situations in preschool and first grade continuum as preschool provides learning prerequisites for later learning. Also, structured sessions are traditionally teacher-led while during free play adults may be engaged in adult conversation or classroom organization and children display thinking with each other rather than with the teachers (Moreno, 2017).

As previous research demonstrates, cognitive functions can be enhanced in quality interaction, but it also demonstrates a lack of research of teacher-student interaction when teachers are not trained for mediation. For this reason, I am interested in finding out how teachers' actions in structured sessions in school context reflect mediation. How does mediation vary between teachers and over time? In what ways does teachers' pedagogical thinking reflect aspects of cognitive education and classroom interaction? In what ways does teachers' pedagogical thinking reflect mediation? Answers to these questions will help clarify the didactic practices teachers have developed for the cognitive mandate of their teaching and open up their pedagogical thinking on cognitive education. Cognitive, affective and conative aspects of learning are interconnected. Their consideration in teaching is not only a mandate but is valuable as goal-orientation, and the desire, willingness and capability of being involved in a continuous life-long learning process are

increasingly important for an individual in modern society. The joy of learning comes from the experience of success (Rantala & Määttä, 2012) but failures in learning are drastic for an individual and costly to society.

2.4 Teachers' pedagogical thinking and mediation

Pedagogical thinking means thinking in accordance with the aims and goals stated in the curriculum and taking stands and making decisions within the context of the curriculum (Kansanen & al., 2000). Such thinking reflects teachers' concepts of human beings, knowledge and learning (Patrikainen, 1997). It is determined by pedagogical expertise (Kansanen, 2004) but it is also connected to personal thinking styles (Zhang & Sternberg, 2002) and guides individuals' perceptions of reality and beliefs to what is true (Spodek, 1987). Beliefs and knowledge constitute individual's implicit and practical knowledge (Kansanen et al. 2000, p. 59) in which beliefs are commitment and knowledge factual propositions. Pedagogical thinking and teacher cognition (Fang, 1996) may be studied by examining teachers' diaries, portfolios, essays or plans (Kansanen 2004, p. 95), also by interviews which may contain visual methods, retrospective narration and Critical Incident Techniques (see Johnson Longfor, 2014; Ahonen, 2018).

Finnish preschool teachers and first and second grade teachers have theoretical views of teaching and learning which are different among preschool, first and second grade teachers (Haring, 2003). Haring found preschool teachers thinking to apply notions which reflected humanistic empirical thinking. The thinking of preschool teachers contained social constructivist views of learning. First and second grade teachers' thinking demonstrated more variation and included less opinions and views on students' learning. All teachers highlighted the relationship between development and learning, the importance of motivation, the structuring of knowledge, metacognition, students' self-directed learning and the impact of the learning environment on learning (Haring 2003, p. VII), although the groups of teachers differed in their views on teaching. The preschool teachers' views were more child-oriented and interactive, whereas, the views of first and second-grade teachers were more teacher-oriented. An explanation for the unity in preschool teachers' thinking may be the traditional way of working in teams (Melasalmi & Husu, 2015). In the Finnish preschool context knowledge is shared between co-workers and understanding is reconstructed in negotiations which are required due to joint educational decisions. In classroom teaching, teachers most often teach by themselves and class teachers are less able to benefit from team decisions or common justifications in their decision making.

Finnish preschool and first and second grade teachers' views on teaching and learning might have evolved since the findings of Haring, but not necessarily, as

traditions may hinder change. Teachers' perceptions on fostering higher order thinking in science education (Zohar, 2013) demonstrated challenges in including thinking about multiple, varied and specific contents. The conclusion derived from teacher interviews demonstrated that planning a coherent developmental sequence of thinking goals and professional knowledge in teaching higher order thinking and metacognition on a large scale seemed to be a somewhat slow process rather than one that could be solved quickly due to certain teaching traditions. The consideration that content goals had priority over thinking goals was seen to be an obstacle in the process. Thus, the tradition of content delivery over enhancement of learning to learn and thinking can function as an obstacle for change in the actions and pedagogical thinking of teachers. But as content cannot be successfully transmitted without an awareness that cognitive functions are equally as important as content matter, this means that teachers need to adjust their pedagogical thinking and practices accordingly.

Thinking styles (Zhang & Sternberg, 2005), which relate both to abilities and personality (Rayner, Sternberg & Zhang 2012, p. 12) have been used to explain the relation of thinking and action. A hierarchic thinking style has been found to relate to effective pedagogical content knowledge (Canbolat, Erdogan & Yazlik, 2016). Legislative thinkers have shown themselves to be open to new ideas whereas liberal thinkers are willing to take risks in trying out new teaching materials (Zhang & Sternberg, 2002). These results show that teachers' thinking is not affected only by theoretical perspectives of teaching and learning, work community or traditions, but personal preferences and qualities have a say in how teachers approach educational issues and topics even if a causal relationship between the style and action does not exist. It is essential in the theory of thinking styles that people have a need to manage their everyday activities in a comfortable way, but as situations require adaptation the styles should be flexible rather than fixed (Zhang & Sternberg, 2002). These points suggest that traditional ways of preferring content can be modified to encourage the enhancement of learning prerequisites in teaching.

Teacher's pedagogical thinking has many aspects. Dimensions such as limited and narrow (Ahonen, 2018; Ahonen, Pyhältö, Pietarinen, & Soini, 2014) and surface thinking (Mouza, 2017) have been used to describe it. In a study on teachers' beliefs about their roles and the pupils' roles in meaningful learning, Ahonen et al. (2014) found that teachers recognized the importance of facilitating pupils' active role in learning, but still considered that pupils were mostly passive in school practices. Correspondingly, teachers described themselves primarily as knowledge transmitters in pupils' learning rather than facilitators of learning. Finnish comprehensive schoolteachers' pedagogical thinking on active learning was limited and it manifested itself somewhat narrowly (Ahonen, 2018). Ahonen states that dependency on situations, the goal of the activity and the persons involved led to an unsystematic consideration of active learning in teaching. Similarly, in a study on the

implementation of technology in teaching, surface understanding of computational thinking led to teachers being unable to design lessons that meaningfully integrated computational thinking concepts and tools with disciplinary content and pedagogy (Mouza, 2017). When teachers are challenged with technology and changes in the concept of learning, adjustment seems to take time both on the pedagogical thinking and on the action level of teachers. Teachers' pedagogical thinking on enhancement of cognitive functions might not be an exception.

Teachers' knowledge, which is part of pedagogical thinking, and action (Syrjäläinen, 2003) has interested those researching teacher thinking. Teacher cognition such as noticing and interpreting teaching and learning situations (Lee, 2017) has been connected to teachers' ability to enhance mathematical thinking. Lee found that preschool teachers with more teaching years can interpret and enhance the mathematical thinking of young children better than teachers with fewer years of teaching. Furthermore, noticing was not associated with teachers' ability to interpret, which was an indication of teachers' ability to notice not necessarily translating into an execution of the interpretation. Besides reflecting teacher's pedagogical thinking with styles, teachers' implicit theories and personal belief systems, it may be organized at different levels of abstraction and be modeled with a pedagogical-level thinking model (Kansanen & al. 2000, p. 25; Kansanen 2004, pp. 97-98). The original idea of Eckard König has been implemented to describe teachers' pedagogical thinking in music education (Sepp, 2014) and to examine teachers' pedagogical thinking in mathematics education (Patrikainen, 2012). Also, teacher educators' guiding practices have been differentiated at the action level, the object theory level and the metatheory level of thinking (Jyrhämä, 2002). Action level pedagogical thinking contains teacher's thinking prior to the instructional interaction as well as thinking during and after it. At the object theory level, action level events are structured using theoretical concepts and models. Metatheory level pedagogical thinking contains a synthesis of object theory level conclusions. Especially philosophical, ethical and value related pondering is central to metatheory level thinking. Jyrhämä found that teacher educators' guidance mostly targeted action level matters. One third of the guidance represented object theory level matters and a few percent metatheory level matters (Jyrhämä 2002, pp. 97-107, pp. 112-116.). Action level pedagogical thinking is also dominant in music teachers' thinking (Sepp, 2014).

I apply the works of Kansanen (ibid.) and Sepp (ibid) to present a pedagogical thinking model of teachers' pedagogical thinking on cognitive education. Constructs which theorize teacher knowledge have their limitations due to the nature and complexity of teachers' pedagogical thinking but differentiating teachers' pedagogical thinking opens up the content and structure of it, which in this study focuses on teachers' pedagogical thinking on cognitive education. This may advance understanding of mediation in structured small group sessions.

Table 1. Model of teacher's pedagogical thinking in cognitive education context

Thinking level	Essence of cognitive educator's thinking
Metatheory level	• vision of the task of cognitive education in society and students' life • awareness of the history of cognitive education, values and traditions • understanding of the philosophical underpinnings of cognitive education
Object theory level	• perceptions of cognitive functions as transversal competencies in the school curriculum • awareness of theoretical criteria of enhancement of cognitive functions: objectives, main concepts, content and structure in teaching • reflection on teaching techniques, methods and approaches towards cognitive education in one's practice • elaboration of the nature of cognitive functions • critical thinking of the traditions of cognitive education
Action level	• basic knowledge of the content in cognitive education • knowledge about students' cognitive functions and difficulties in their enhancement • perception of different techniques, interactions, methods and models for cognitive education • contextual solutions in teaching cognitive functions and prioritization in the cognitive curriculum • creation of relevant material for teaching and assessing cognitive functions

When the model of teacher's pedagogical thinking is applied to the MLE theory context, action level thinking contains teachers' thoughts on their planning, interaction and evaluation of the instructional process regarding the enhancement of cognitive functions. At the object theory level of thinking, teachers reflect on these actions and provide justifications using theoretical concepts and models on cognitive education. Teachers have a theory of cognitive education practices and they utilize critical thinking when evaluating them. In this level teachers need pedagogical content knowledge of cognitive education and methodological knowledge of research in the field of cognitive education. At the metatheory level teachers ponder values of cognitive education and ethical justifications for it.

As previous research shows cognitive aspects in teaching are easily set aside with the preference on other contents and many other teachers and work culture related aspects may have an impact on teachers' pedagogical thinking. However, teachers' content knowledge has a significant relationship in students' achievement (Campbell et al., 2014) and pedagogical thinking, which can be very personal, has a potential quality to change. I find it important to examine teachers' pedagogical thinking on cognitive education and MLE. How teachers view the task of education, describe their role, perceive student intelligence, and teach thinking and learning to learn are aspects of teachers' pedagogical expertise in cognitive education. Do teachers elaborate dimensions of cognitive education in a narrow or surface manner, which shows in partial description of the intellective, non-intellective and conative aspects of cognitive education and mediational teaching? Or does teachers' thinking demonstrate comfort in describing knowledge, understanding, operations, strategies for thinking and habits, attitudes, motives, dispositions and

the will to do things? Do teachers, moreover, describe the ways they consider these dimensions in planning, teaching and evaluation, and thus demonstrate thinking which supports cognitive education systematically? Or does their thinking represent the action, object and metatheory levels and pedagogical expertise to not only notice but interpret and execute the interpretations to enhance students' cognitive functions while providing theoretical justifications for their actions and meta-analysis of the underlying values of cognitive education and demonstrate expert thinking in cognitive education? As research lacks studies which examine teachers' pedagogical thinking on cognitive education and MLE, I am interested in finding out the ways teachers' pedagogical thinking reflects aspects of cognitive education and classroom interaction, and the ways in which teachers' pedagogical thinking reflects mediation. Does the thinking reflect expert thinking, which not only supports active cognitive education but contains visions of the future and an understanding of its historical and philosophical background? If teachers' pedagogical thinking does not explore the cognitive task of education at these levels, does teachers' pedagogical thinking *support* action level practices and contain descriptions of planning, implementing and assessing development of cognitive functions? Or is the nature of their thinking partial so that it includes some parts of active cognitive education while lacking others and thus providing only *partial* support for cognitive education? Furthermore, I am interested in finding out whether there are areas of cognitive education which the teachers are not aware of and their pedagogical thinking in that respect does *not support* cognitive education. Examining teachers' pedagogical thinking at the levels of no support, partial support, support and expert thinking gives access to the knowledge base teachers utilize for cognitive interaction. Teachers are faced with continuous development demands as research provides more specified data on learning and the curriculum sets them updated tasks. How teachers consider research findings and curriculum demands and integrate them into classroom practices requires pedagogical thinking.

3 RESEARCH TASK AND RESEARCH QUESTIONS

The purpose of this study is to describe and understand preschool and first grade teachers' cognitive interaction in small group structured sessions. I investigate teachers' interaction and how it appears when drawing upon Mediated Learning Experience (MLE) theory. I examine teachers' pedagogical thinking to find out how it reflects aspects of cognitive education and classroom interaction. I present the following research questions based on the research task:

I Teaching and Mediated Learning Experience (MLE)

1.1 How do teachers' actions reflect mediation?
1.2 How does mediation vary between teachers and over time?

II Teachers' pedagogical thinking on cognitive education and MLE

2.1 In what ways does teachers' pedagogical thinking reflect aspects of cognitive education and classroom interaction?
2.2 In what ways does teachers' pedagogical thinking reflect mediation?

The scientific method for this study is qualitative. Qualitative scholars reflect on the interpretative approaches they use to explore the world and phenomena. I am interested in the meanings of verbal and non-verbal interaction that refers to social constructionism. For constructivist philosophy, understanding is the goal and causal relationships are of less interest. The epistemological foundation of my study is based on the understanding that no direct knowledge is possible from my research subjects. Knowledge requires analysis, interpretation and a rationale, which is utilized in the meaning making process by the counterparts involved in the instructional process, by the teacher who interprets the curriculum, and the students who study and learn the matters stated in the curriculum. It is my understanding that the knowledge acquired by instructional interaction is fallible and changing, as the social and historical context affects the interaction and the knowledge derived from it.

The methodology of this study follows the guidelines required for interpretation within the hermeneutic research tradition. I use observations and reflect upon them within the MLE paradigm. The methods have been verified in previous research and my research interest is practical. The science of education is not neutral in relation to its practice, and researchers carry the responsibility of developing of this practice (Siljander 2002, p. 92). The principle "von der Praxis für die Praxis" – from practice for the practice (see Siljander 2002, p. 90) provides the foundation for this study.

My preunderstanding of classroom interaction has developed throughout my studies at the university and my years in classroom teaching. I received my master's degree in Education at the University of Helsinki, complemented the degree at the Western Connecticut State University, USA and obtained teacher certification in the state of Connecticut. I was trained to use the Instrumental Enrichment and Bright Start cognitive programs and dynamic assessment. I am a certified Bright Start trainer. In 2005, I participated in the IACEP conference (International Association for Cognitive Education and Psychology) in Durham, England with my colleague Tanja Talvensalo, and am connected internationally with professionals interested in cognitive education. In 2006, we visited the Bar Ilan University in Ramat Gan, Israel, to attend a course at the Pnina Klein Center to learn to use the Observation of Mediation Interaction (OMI) instrument. I have taught courses on dynamic assessment and thinking skills at the special education unit of the teacher education department at the University of Helsinki. Teachers who attended the courses quite often remarked that they were implementing the principles of the MLE interaction in their work at kindergarten and basic education. This increased my interest in finding out about the appearance and nature of instructional interaction in kindergarten and basic education by scientific means.

4 RESEARCH DESIGN AND METHODS

In the previous chapters, following a hermeneutic approach (Gadamer & Nikander, 2004), I described my preunderstanding regarding the teaching of cognitive functions and defined the concepts that are relevant for this study. As within the hermeneutic approach a preunderstanding of a phenomenon can be subjective, I described my knowledge and differentiated it from scientific facts. Furthermore, I explained that in cognitive interaction, the criteria of mediation for Mediated Learning Experience (MLE) are followed as teachers try to elicit evidence of thinking from children in several ways. In section 2.1, I defined the concepts required to describe the nature of cognitive interaction in preschool and first grade classrooms, which also forms the basis for my interpretation and analysis. In this chapter, I describe the overall research design of my case study and its rationale.

The core of my research design is based on my research problem, which also provided the overall strategy for integrating the different components of this study. That is, the need to examine teaching and mediated learning experience (MLE) in structured small group sessions in preschool and first- grade structured sessions and teachers' pedagogical thinking on cognitive education and MLE drawing upon MLE theory constituted the central line of thought for the collection and analysis of data. My study relies on observation, interview, and doing document analysis on classroom interaction in situations where teachers do not use a specific intervention program.

To answer my main research question, I use video observation for collecting the data. Video observation of teacher-student interaction provides the best possibilities for analysis of the interaction as the videos can be watched several times and the interaction reviewed, which is not possible by making field notes on the interaction. Importantly, mediation may appear even if a teacher is not trained to implement cognitive programs. However, as the Finnish curriculum is binding, all teachers need to consider cognitive aspects in their teaching, and as mediation emphasizes the role and responsibility of the adult in the interaction, I focus on the actions of teachers who are not trained to implement any specific cognitive programs. My desire to answer the research problem using authentic data collected from small group interaction is based on the practices of the Bright Start cognitive and metacognitive curriculum. The program is implemented in a small group of three to six students (Haywood, 2003). The teaching of thinking in small groups is supported by the Three-tier model by Howie (2011, p. 47) and the teacher-student interaction study by Tzuriel & Remer (2018). I used the concepts of MLE theory to quantify teachers' actions and to describe the nature of the interaction. With

this data, I specifically want to understand 1) How do teachers' actions reflect mediation? and 2) How does mediation vary between teachers and over time?

In addition, I interviewed the teachers to study their reflections on teaching cognitive functions as video observation alone provides only a one-sided access to the interaction, which is guided by pedagogical thinking. Understanding teachers' pedagogical thinking may be increased by using interviews. With this data, I specifically want to understand 1) In what ways does teachers' pedagogical thinking reflect different aspects of cognitive education and classroom interaction? and 2) In what ways does teachers' pedagogical thinking reflect mediation? Figure 1. depicts the overall process.

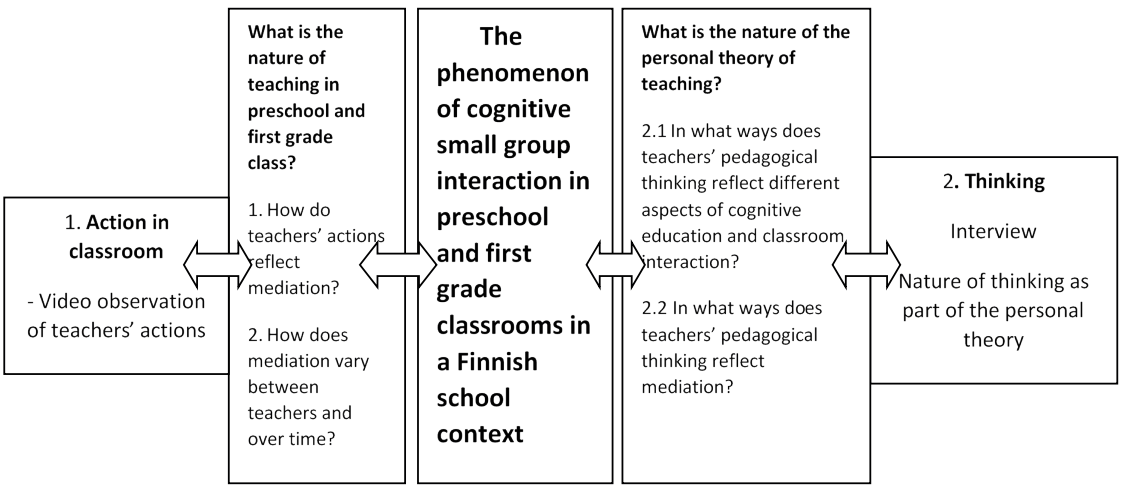

Figure 1. Research Design

In all, my understanding of the phenomenon of mediational interaction in teaching is established by examining videotaped interaction and by interviewing teachers on cognitive aspects of classroom interaction. My goal to develop an understanding of the phenomenon leads to an emphasis on qualitative data. In accord with the hermeneutic approach (Gadamer & Nikander, 2004) my investigation into the parts of the MLE phenomenon, and understanding them, is guided by referring to the whole to answer the research questions.

In the next sections I describe my data source and the process of finding the cases, introducing them and defining their characteristics. I present the methods and instruments for collecting data in section 4.4.

4.1 Selection process of the cases

I collected the data for this study in the capital area of Finland in 2008-2009. Five preschool teachers from different preschools and one first grade teacher from an elementary school participated in the study. I reviewed the research permission procedures of four municipalities in the capital area of Finland and applied for permission in a municipality where I did not have personal connections. This was to improve non-bias reporting of data (Creswell 2003, p. 184).

I contacted principals, preschool teachers and primary school teachers in the municipality once permission for research had been granted me. In my e-mail, I introduced myself and the research project. I wrote that the head of the education department favored the study and participation in it. I stressed that all data would be handled with confidentiality. I offered more information and answers to any questions regarding the study by e-mail or by phone. Several principals contacted me and expressed their interest in the study. Five preschool teachers responded quickly, but only two teachers from primary schools. One of the primary school teachers withdrew from the study the day after signing up for it. Although I offered a substitute in the classroom for the time of videotaped sessions, the number of volunteers from primary schools did not increase.

My original plan had been to find five preschool teachers, five first grade teachers and five second grade teachers for the study. I reasoned that 15 teachers from three grade levels would have provided an opportunity to study cognitive interaction with children of different age. The data would have covered the three years of education which are considered to form a unity in the Finnish educational system. But as Patton (2002) states, there is no rule of thumb to tell a researcher precisely how to determine the broadness or narrowness of a study or the size of the sample. He argues that broadness and narrowness depend on the purpose of the study, why and what one wants to find out, how the findings will be used, the resources available, the time available, and the interest of those involved in the study (Patton 2002, pp. 227-228, 244-245). Qualitative methods typically produce a wealth of detailed data about a much smaller number of people and cases than do quantitative instruments. Even though my interest had been to have a larger number of teachers involved, it seemed that with the resources I had available, I was unable to increase the number of volunteering teachers. As my goal was not to generalize the findings from the sample to any population, I decided to continue the study with the volunteers I had. My decision is also supported by Stake (2000, p. 446), who introduces two criteria to consider on the selection of cases for a case study: representation of the larger group and offering opportunities for learning about the phenomena of interest. Stake considers the potential for learning to be a superior criterion to representativeness.

The timing of the research request might have lowered the interest of primary school teachers, as I sent it at the beginning of the summer when teachers are on their way to the summer break. I repeated the request during the summer and at the beginning of the school year with no change in the volunteering number of teachers. The low number of volunteering primary school teachers may be due to factors other than timing. Schools in the capital area of Finland offer teaching practice placements for student-teachers from the university. Schools host international visitors and participate in national and local level assessments and research. There might have been some sort of exhaustion in participation in research. Demanding work might also be a factor influencing the low desire to take part in a study. When working conditions are demanding there is a limited amount of personal resources for activities other than the work itself. One primary school teacher responded to my request by saying that videotaping students in a group of four does not represent real-life teaching. This response might be a signal of demanding work conditions. It might also refer to the fact that the size of a typical primary class is between 20-30 students. There are lessons in lower primary grades, when the class is half that size, and sometimes students work in groups of four. Teachers who participated in the study stated that sometimes they only have three or four children in their class. The method of inquiry might have also diminished the number of volunteers. Teachers might have felt uncomfortable with the thought of being videotaped, even though in all requests confidentiality was stressed.

Teachers who signed up for the study proved to be information-rich and fulfilled the requirements of purposeful sampling (see Patton 2002, p. 230). With five preschool teachers I had a multiple source of data and the one first grade teacher was the minimum for having an opportunity to examine first grade interaction. I was able to cover my research needs with the sample size. Patton (2015, p. 314) states that determining a purposeful sample size is a matter of judgement and negotiation. He recommends that qualitative sampling designs specify minimum samples based on expected reasonable coverage of the phenomenon given the purpose of the study and stakeholder interests. I was able to cover the phenomenon of my interest reasonably.

I ended up following the principle of potential for learning and decided to continue the study with the teachers who had confirmed their participation. They worked in different districts of the municipality. They had many years of teaching experience and were qualified teachers. Experience and qualifications provide practical and theoretical potential for understanding the demands and requirements of national, local and school specific curriculums and skills to convert the requirements into quality teaching. None of the teachers had been trained to utilize cognitive programs in their teaching. It was my goal to examine teachers with all the above qualities.

Preschool education in Finland is organized in a daycare or school environment. It is usually provided for one year before basic education for a minimum of 700 hours. The minimum of lessons in the first grade is 19 hours per week and the maximum length of the school day is 5 hours. (Perusopetuslaki 1998/628, §1; Perusopetusasetus 1998/852, §3, §4). Early childhood education and lower grades of basic education are set a special task to enhance the prerequisites for studying and learning in later years and to generate the desire for life-long learning.

4.2 Teachers' profiles

To verify the qualifications and experience of the teachers I asked them to fill in a personal data and feedback form (see Appendix G). I also used the form to cross-check the data obtained in the teacher interviews. I present the professional profiles of the teachers in Table 2. and briefly introduce each teacher.

Table 2. Teachers' profiles

Research participants	**Teacher 1**	**Teacher 2**	**Teacher 3**	**Teacher 4**	**Teacher 5**	**Teacher 6**
Work title	Kindergarten teacher	Kindergarten teacher,	Kindergarten teacher	Kindergarten teacher	Kindergarten teacher	Class teacher
Education	Social educator (Sosiaalikas-vattaja)	BA Bachelor of Education Special education kindergarten teacher	Social educator (Sosiaali-kasvattaja)	BA Bachelor of Education	BA Bachelor of Education	MA Master of Arts
Work Experience	11-15 yrs	1- 5 yrs	Over 20 yrs	6-10 yrs	11-15 yrs	Over 20 yrs
Training on MLE or cognitive programs	None	None	None	None	None	None

The language teachers used for instruction varied. Four of the teachers used Finnish in their instruction, and two teachers used English in their instruction. I verified the children's background with a questionnaire (see Appendices B and C) which was filled in by the parents. All children in the study were native Finnish. No parents reported their child having any learning difficulties. The age of the children varied from 5-6 years in preschool. The age of the children varied from 6-7 years at first grade.

In the next section I describe my data collection schedule. I introduce the methods which I used to collect the data and illustrate my rationale for them. I

describe how I oriented myself, the teachers and the students for the data collection, and outline the process of acquiring the videotaped and interview data.

4.3 Data collection

I scheduled the arrangements for the data collection for a school year from fall 2008 to spring 2009 (for a detailed data gathering schedule see Table 3 below). I chose observation with videotaping as the main research method to catch the verbal and non-verbal communication of the teacher in authentic small group interaction. I used the verbal and non-verbal data as the main data for analysis. Supplementing methods include orientation for the data collection, teacher interviews and a teacher background questionnaire (Appendix G) which I sent to the teachers after all the video data had been collected. My research problems determined the methods by which I considered it possible to solve them (see also Venkula 1993, p. 54) and which were verified by previous research.

Table 3. Data collection schedule

Time	Data collection and communication with teachers and schools
Spring 2008	Research permission from the municipality
June 2008 – August 2008	Inquiry sent to preschools, primary schools and teachers by e-mail
August 2008	Visits to preschools and primary school Distribution of information letters and parental consent forms Request for children's background information
September 2008	First videotaping of the lessons (30 minutes, 4 students) Teacher interviews
November 2008	Second videotaping of the lessons (30 minutes, 4 students)
February 2009	Third videotaping of the lessons (30 minutes, 4 students)
May 2009	Background questionnaire to the teachers with the possibility of providing feedback on the participation in the research

I sent information about the study and data collection to the volunteered teachers (Appendix A). I informed them that there would be an orientation meeting in August where the goals and methods of the study would be discussed. Teachers were notified that their lessons would be videotaped three times during the school year; once in September, once in November and once in February. I asked the teachers to choose four students, two boys and two girls, with no diagnosed learning difficulties from their class for the study. The aim in this study was not to examine interaction with students with special needs. I chose small group interaction as I considered that teachers would have more opportunities for cognitive interaction when they were able to focus on a smaller number of children than would be the case in a large group. Opportunities for more individualized and effective teaching

practices are higher in smaller groups. The larger the class size, the more teacher-directed teaching practices the teacher typically deploys (Lerkkanen & al., 2016). Teachers can teach more effectively when there are fewer students whose individual needs require the teacher's attention. Smaller groups might help students to focus on their studying and learning when their individual needs are attended to. It was confirmed by Teacher 1 in the initial interview that attentiveness was better when there was a small group. When students are attentive the grounds for interaction between the teacher and students are favorable for teaching, studying and learning.

I sent a letter, a consent form and a form for background information on the child (Appendices B, C, D, E) to the teachers so that they could forward them to the parents of the children who the teachers had selected for the study. I asked the teachers to teach the group of four children for half an hour as they would have done in their class normally. The content and teaching methods for the lessons were for the teachers to decide. Learning sessions at preschool last about 30 minutes. In lower primary school lessons are 45 minutes, but active work time is usually about 30 minutes.

4.4 Methods used

4.4.1 Orientation for the data collection

The process of applying for research permission and finding volunteering teachers oriented me to the context of the municipality where the study was taking place. To orient the teachers and students in the study I visited each school beforehand. The visits also gave me a chance to build a preliminary understanding of the microlevel context of the study.

I visited the preschools and the primary school in August 2008 before the videotapings. I presented the tape recorder and the videocameras to the students and teachers. I discussed the goal of my study with the teachers. To plan a schedule for videotaping lessons and interviews teachers suggested the best days in a two-week period during the month of the videotaping. The videotapings were scheduled to take place in the morning. One exception was the class teacher whose lessons were videotaped in the afternoon when she had a chance to divide her class into smaller groups and had an assistant teacher available to work with students who were not participating in the study.

Teacher interviews were scheduled to take place immediately after the first videotaping. Scheduling the videotaping and interview for the same day was to minimize the interference with teachers' work. It was also possible to discuss teachers' experiences of being videotaped and confirm their willingness to continue with the study. It was considered that the content of the interview might have an effect on the actions of the teachers. I gave the teachers a notebook for their thoughts

and reflections during the study. Notebooks were to be returned to me at the end of data collection. No teacher, however, used the notebook for reflection. When the initial videotaping started in September, the videocameras created excitement in many of the children. The recordings showed that teachers referred to my initial visit when all the equipment had been introduced. This had a calming influence on children. In the November and February recordings the children's reactions to the cameras were noticeably less or even non-existent.

4.4.2 Videotaping of the lessons

The research interest and nature of the phenomenon being studied directed the choice of methods. As mediational teaching and cognitive interaction can occur in many forms and in any part of the lesson, a videocamera was useful as it can capture longer periods of action and nuances which a site observer might miss. Videotapes make it also possible to review the recordings, which was necessary during the data analysis process.

Teachers' lessons were videotaped on different weekdays during the year. It was in my interest to get video data from each teacher with varying contents of teaching, as different contents may call for different amounts of cognitive interaction. Patton (2002, pp. 234-235) calls these actions maximum variation sampling, which aims at capturing and describing the central themes that cut across a great deal of variation. In small samples heterogeneity can be a problem, but maximum variation sampling turns the weakness into a strength by allowing common patterns emerging from great variation to capture central dimensions of a phenomenon. My goal was to capture as much of the cognitive interaction in a structured small group interaction as possible. For this reason, I was not interested in varying forms and detecting dimensions of patterns of interaction in other situations. In Table 4 I describe the content of the videotaped lessons and their duration.

Table 4. Content of the videotaped lessons and their duration

Research participants **Content of the lessons** **1=September** **2=November** **3=February**	**Teacher 1** 1. Spatial relations, Environmental studies 2. Finnish 3. Finnish, Mathematics	**Teacher 2** 1. Finnish 2. Mathematics 3. Mathematics	**Teacher 3** 1. Finnish 2. Mathematics 3. Mathematics	**Teacher 4** 1. Environmental studies 2. Finnish 3. Environmental studies	**Teacher 5** 1. Art 2. Mathematics 3. Handicrafts	**Teacher 6** 1. Art 2. Mathematics, Reading 3. Reading, Art	**Total lesson time observed (h, mins)**
Lesson time observed in September	00:29:44	00:39:52	00:40:01	00:40:08	00:33:18	00:35:16	**3:38:19**
Lesson time observed in November	00:29:56	00:34:30	00:36:00	00:34:05	00:40:30	00:29:31	**3:24:32**
Lesson time observed in February	00:33:43	00:26:15	00:46:17	00:28:21	00:40:30	00:43:59	**3:39:05**
Total lesson time observed (h, mins)	**01:33.23**	**01:40:37**	**02:02:18**	**01:42:34**	**01:54:18**	**01:48:46**	**10:41:56**

The content of the videotaped lessons varied, and no teacher taught the same subject in each of the three lessons. The total length of lesson time videotaped was 10 h 41 min. 56 s.

I pretested setting up the cameras and angles of the shooting with researcher and designer Mikael Kivelä and his assistant at the University of Helsinki in August 2008. I decided to use two cameras for data collection; one focusing on the children, and the other one on the teacher. A microphone was placed on the teacher to maintain a consistent distance and angle throughout the shoot. I was not present in the classroom when the videotaping took place. I intervened in the first videotaped lessons briefly to check the operation of the cameras and ensure the visibility of the teacher and students in the chosen camera angle. My chance to observe the lesson and make field notes was hence given up with the decision not to be present in the lessons, but I trusted the videotaping to capture the features which were of interest to me. Later, the participants agreed that it had been more relaxing not to be observed during the lessons other than by the videocamera. Mikael Kivelä converted the videofiles and interview files to DVDs.

Data collection in the field can be challenging. Successful selection of good methods alone does not necessarily lead to capturing the phenomenon successfully. Classrooms are public, but they contain privacy elements regarding students and teachers. It was important to pay attention to good research conduct, appreciation and respect towards the volunteered teachers, students, their work and work sites. Furthermore, only functioning cameras and microphones, in addition to their successful placement produce useful data. It was of primary importance to see and hear the participants of the study well, and to be able to name the person who was speaking. In a DPA study by Koskenniemi & al. (1977, p. 32), for example, the inability to name the person speaking in the audiotapes had caused a problem in creating a systematic category for classroom interaction and answering the main research problem. Good technological tools support video researchers' work (Derry et al., 2010, p. 24). For video acquisition and to capture what was needed in this study, an experienced camera crew was necessary. Goodwin (1993, p. 188) urges researchers to get the absolute best in the field as the sound [and the recording] does not improve later. Mikael Kivelä and his assistant ensured proper placement of cameras in the different classroom conditions. The experienced crew solved any technical problems. A professional camera crew and a respectful attitude in setting up and taking down the cameras communicated respect to the research sites. Researchers need to respect research sites (Creswell 2003, p. 65), requiring researchers at a site to be conscious of their impact and minimize their disruption of the physical setting.

4.4.3 Teacher interviews

Teacher interviews, which were scheduled to take place after the first videotaped lesson, provided me with teacher background information. More importantly, my desire was to use the interview data to examine teachers' pedagogical thinking and how it reflects aspects of cognitive education, classroom interaction and mediation. I interviewed teachers on pedagogical matters. I asked them to express their views on education and how they perceived their role in it. In addition, I was interested in teachers' thoughts on teaching and learning. I asked teachers to describe how they perceived intelligence, thinking skills, motivation, attitudes, feelings and learning to learn. I was also interested in their views on the MLE parameters: intentionality, reciprocity, meaning, transcendence, feeling of competence and regulation and control of behavior. See Appendix D for the outline of the interviews.

When interviewing the teachers and discussing with them I was also able to verify whether they utilized cognitive programs and if they had been trained to use them. In addition, I was able to detect teachers' desire to continue in the study after the first videotaping which needs to be considered to ensure ethical conduct in research.

I recorded the interviews and made notes during them. I transcribed and analyzed the interview data to develop an understanding how teachers view the role of education, themselves and interaction in teaching cognitive functions and how they conceptualize the MLE parameters. In the one-on-one, face-to-face interviews, I presented teachers with open-ended questions (Appendix F) which were designed to help teachers articulate their knowledge. Teachers' thoughts and implicit theories have been studied, for example, using a repertory grid technique. Clark & Peterson (1984, p. 18) explain that the technique was developed by Kelly (1955) as a method for discovering the personal constructs that influence individual behavior. An individual is presented with a series of cards on which are written single words or statements about the domain of interest to the investigator. The subject is asked to indicate which cards are alike or different and to explain why. The resulting groupings and their associated rationales are labeled "constructs" by the investigator. The constructs and their component elements are then arrayed in a grid format to show the relationships between constructs. I applied the idea of the repertory grid technique in the formulation of the interview questions. I presented teachers with a single word describing the parameters of MLE and asked teachers to reflect on it. I used the reflections and teachers' rationales as constructs of pedagogical thinking about the MLE parameters. The questions and constructs in my interviews resembled the dimensions used by Yrjönsuuri & Yrjönsuuri (1995) in their study on teaching as intentional guidance of students' learning. Yrjönsuuri & Yrjönsuuri examined intentional teaching using the dimensions of content knowledge, educational knowledge, context knowledge, didactic knowledge, evaluation knowledge, method knowledge and interaction knowledge (Yrjönsuuri &

Yrjönsuuri 1995, pp. 47-48). Similarly, I asked the teachers to reflect on education, teaching, learning, and interaction. The first questions functioned as orientation questions. Their role was to open up the thinking processes and lead the interview to the questions which were more specifically related to MLE parameters and the core of my research.

4.4.4 Teacher background questionnaire

The teacher background questionnaire, (Appendix G) provided me with information about the research participants' education, work experience and personal preferences in teaching. It also verified the information which teachers had provided me with at the initial interviews. In the questionnaire, the teachers were able to comment on how they had experienced participation in the research during the year. I analyzed the data by reading the questionnaires several times and then focused on the data which helped me to verify teachers' qualifications and experience, lack of training to implement cognitive programs and their experience about participating in the study. The data answering these questions verified that the participants were qualified and experienced teachers. This was important to me to ensure quality teaching. No teachers had training in cognitive programs, and the teachers' experience in participating in the study was positive.

4.5 Data handling and analysis process

In this section, I describe how I handled the teacher-student interaction and teacher interviews data and analyzed it. I start by discussing the handling and analysis of the interview data. I present the two description systems, which I applied to analyze the video data and explain the content analysis of the interview data. Consideration of research ethics was important to me during the research process. In section 7.1.5 I explain how I considered research ethics in the handling and analysis of the data.

4.5.1 Analysis of teacher-student interaction

I modified and applied characteristics of Klein's (1987) mother-child mediated interaction observation model and Leiwo et al.'s (1987a, 1987b) classroom interaction model to analyze the video data. Klein used a macroanalytic mother-child mediated interaction observation model to examine mediational interaction between a mother and child in an informal environment. As my research interest was in formal classroom interaction, I complemented Klein's model with the Leiwo et al.'s. Next, I will describe the two systems and differentiate how I utilized them in the analysis of the data.

The Observation of Mediational Interaction (OMI) instrument by Klein et al. (1987) utilizes the MLE parameters. It was developed for mother-child mediational interaction. The categories used in it are focusing (intentionality and reciprocity), affecting (meaning), expansion (transcendence), competence (feeling of competence) and regulation of behavior (regulation and control of behavior). Focusing is about catching the attention of the child. Verbal means of catching the child's attention would be for example "Look!" or "Do you see that?". The child's attention can be caught through nonverbal means, for example by bringing an object to the child. Klein coded both verbal and nonverbal expressions. To qualify behaviors as focusing they must be intentional on the part of the activator and reacted to by the other partner. Affecting is about holding the attention. Affect may be expressed nonverbally with a smile, a sigh or laughing. Klein also considered that naming affects the attention. Naming includes giving or requesting information in the form of names or descriptions and gives meaning to the item named. The combination of naming and nonverbal expressions of affect are coded. Expansion is about going beyond what is functional and refers to transcendence. Klein considered expansion in relation to the content of specific experience, clarifying processes of thinking and general rules. Competence may be recognized verbally and non-verbally. A response to a specific behavior performed might be "Good", "Great", "mmm", clapping hands or smiling. A reinforcement with explanation may be provided. Klein also considered that modification of a situation allowed success, such as breaking up a task or making it easier, so the child can experience success as behavior towards competence. Behavior can be regulated verbally and nonverbally. Utterances which regulate behavior in relation to time, space, sequencing of steps, matching ability to task are coded in the regulation of behavior. As demands require no thinking on the part of the child they are not coded as mediational regulation of behavior. Mediational regulation of behavior intends to help the child to do the task more efficiently in the future. In Table 5 I differentiate the concepts of OMI, describe them, give an empirical example and the criteria how the concepts are detected in the data.

In my analysis, I divided Klein's category of Focusing and Reciprocity into two separate categories, *Intentionality* and *Reciprocity*. I was interested in knowing what teachers intend students to focus on (Intentionality) and how teachers react to the students' initiatives (Reciprocity), as child-initiated interactions may evoke different instructional patterns among teachers (Nurmi & Kiuru, 2015). I defined reciprocity *as the teacher's communication and actions with which the teacher responds to the student's initiatives in the interaction*. Theoretically, this change emphasizes *how* the mediation of intentionality act was being carried out by the mediator rather than *when* or *if* the act was considered by the mediatee. Affecting I considered to be the provision and request for meaning in the category of *Meaning*. I was interested in knowing how teachers hold the attention of

students by naming and how they request students to give meaning to matters and things. I examined expanding beyond the learning experience in the category of *Transcendence*. Recognition of good performance and making students aware of good performance I examined in the category of *Feeling of competence*. Regulation of behavior I considered in the category of *Regulation and control of behavior*. I used a microanalytic way to perceive and interpret the verbal and non-verbal actions of the teachers. This was possible and necessary when I focused on the role of the teacher in the interaction. This meant that I was not examining students' cognitive change but wanted to find out to what extent the teachers' actions with the students reflected mediation.

Leiwo et al. (1987a) have examined the linguistic interaction and discourse of teaching and learning. They developed a description system of classroom discourse which was designed to depict teacher and pupil roles in the presentation and controlling of information. The basic unit of the description system is an utterance. The broader units are moves, cycles, episodes and didactic periods. These units form a hierarchical whole. In Table 6 I describe the units, give an empirical example and determine the criteria for detecting the units.

Table 5. Klein's (1987) Observation of Mediational Instrument (OMI)

Concept	Description of the concept	Empirical example	Criteria how it is detected in the data
Focusing and reciprocity	Catching the attention of the child	"Look!" or "Do you see that?"	When an action is intentional on the part of the activator and it is reacted to by the other partner.
Affecting	Holding the attention verbally or nonverbally	"That's a ball." Nonverbal smile, sigh or laughing	When the activator names or requests a name. When the activator expresses affect nonverbally.
Expansion	Going beyond what is functional	We also have a football, basketball, beachball and tennis balls at home."	When the activator makes the learning experience more extensive in relation to the content of the specific experience, clarifying processes of thinking and general rules.
Competence	Recognized success	"Good," "Great," "mmm," clapping hands or smiling	When the activator recognizes success verbally, non-verbally or with an explanation
Regulation of behavior	Intention to help the child do the task more efficiently in the future	"Stretch your arms to catch the ball."	When the activator verbally, nonverbally, in relation to time, space, sequencing of steps, matching ability to task, helps the child to perform

Table 6. Leiwo & al.'s (1987a) description system of classroom interaction

Concept	Description of the concept	Empirical example	Criteria how it is detected in the data
Utterance	**Thematic utterances** related to the topic of teaching. **Nonthematic utterances** related to guidance of students	**Naming:** "These are alder flowers." **Directing and regulating actions:** "On Monday bring money to support this refugee campaign to help mothers and children."	When the teacher names a thing or directs and regulates actions.
Move	The smallest discursive unit	**Teacher's Nondiscursive move** "In an aquarium there can be many kinds of fish. And some of them were presented in the book. And there were some pictures." **Discursive move** "What's the name of this fish? The picture is a little bit small but maybe you can see. Tess?" **Student's comment move** "A birch does not have those kinds of things."	When the teacher explains. When the teacher asks a question.
Cycle	Independent discursive unit based on moves	**Periodization cycles** **Teaching cycles** Teaching light, heat, **Guiding cycles**	When the teacher explains several things and the explanations form a whole.
Episode	Discourse unit used in teaching a certain curricular content whole.	"Aquarium fish" "Taking care of an aquarium" "Signs of spring"	When the teacher teaches content, which is based on didactic teaching objectives
Period	Widest classroom interaction unit	**Starting the lesson** "Tim is absent." **Handling the theme** Teaching the signs of spring **Finishing the lesson** "Page 49 for homework."	When the teacher starts a lesson, handles the content of the lesson theme and finishes the lesson.

Leiwo et al. divided the smallest units, the utterances, into 44 categories which form 8 groups with different content and discursive purpose: presenting information, sectioning, asking, answering, commenting, regulation of behavior, evaluation and other utterances. Utterances form moves (Leiwo et al. 1987a, p. 47). *Moves* are the speaker's shortest independent unit of participation in the conversation and contain core and assisting elements which are defined by discursive functions (Leiwo et al. 1987a, p. 108). They are divided into three main categories: firstly, nondiscursive moves which might be followed by students' actions such as beginning a writing task. Secondly, comment moves can also reflect unexpected discourse, for example refusals and inappropriateness. Thirdly, opening moves involve asking or questioning. Opening moves are independent but

they determine the following move that is the nature of the answer. *Cycles* are independent discursive units based on moves which are related to the teaching theme. Chains of cycles are formed by one or several moves. There are interaction cycles which begin with an opening or commenting move and nondiscursive monology cycles, which begin with a move or phrase such as *well, well yes, well then* and *and*. Leiwo et al. divided cycles according to their didactic purpose. The cycles may be periodization cycles, teaching cycles or guiding cycles (Leiwo et al. 1987a, pp. 122–125). *Episodes* are determined by the content of the episode in which, besides the content, the goals are central. The largest unit of an episode is the thematic lesson which can be divided into teaching themes. An episode consists of an independent unit of a teaching theme. It is regulated by the teacher's strategy of structuring the lesson and materials used in the lesson (Leiwo et al. 1987a, p. 142).

The widest units used by Leiwo et al., *didactic periods*, are based on didactic phases and work methods of the lesson. There are roughly three didactic periods in a lesson: 1. Opening, 2. Handling activities: reciting previous subject matters and homework check, introduction of new subject matter, doing exercises and 3. Ending activities. The didactic periods are mainly utilized as background variables. For Leiwo et al. it meant when comparisons were made between the quality of questions related to checking the homework and teaching a new topic.

I chose the context of the cycles and moves to give meaning to teachers' utterances when making inferences about them. I found it most useful to use didactic periods and episodes to detect intentionality as it appeared that intentionality in these levels was set for every student and for common activities. This meant that I did not consider intentions which a teacher meant for one student during the interaction. Hence, I formed the frame for my analysis using the didactic periods, episodes and utterances based on Leiwo & al.'s classroom interaction model and used Klein's OMI model to form observational categories for MLE parameters as listing of behaviors, which I looked for in the data. When there were actions which I was unable to fit in the listed behaviors, I formed categories based on the data. I called the category resource management (RM).

The analytic process

The analytic process followed the steps which are presented in Table 7. The process advanced in sequences but not necessarily in a hierarchical way.

Table 7. The analytic process

Preunderstanding of interaction in Finnish preschool and first grade setting
Empirical data collection • 18 lessons, three lessons from six teachers in September, November, February
Familiarization with the data • listening to the interviews • watching videos which had been transferred to DVDs • making notes
Transcripts of interviews and videotaped lessons transcribing interviews and verbal and nonverbal actions of teachers and verbal actions of students
Content logs to perceive structures • content of interviews, concepts used, insights expressed, themes related to mediational teaching by Haywood (1985) • content of the lessons, duration • topics of discussion, teacher's actions, students' actions • division of lessons into didactic units and episodes
Reduction of actions • describing teacher's actions in reduced form • searching for core idea of the action
Coding • contextualization • theory-based content analysis • using reduced descriptions to categorize the actions based on MLE parameters • data-based content analysis • categorizing actions whose appearance did not fit the MLE parameters
Quantities • looking for recurrence of actions • sums, percentages, tables
Individual teacher's nature of didactic action • consultation of teacher interviews and background data • contextualization
Time • similarities and differences over time • development • change
Teachers' actions in preschool and first grade setting • findings in relation to one another • recognize the connection of the findings or develop them • recognize the difference between the findings and recognize how the findings reflect the MLE parameters
Understanding the appearance of mediation in a Finnish preschool and first grade setting • connecting the findings to the theoretical paradigm

My preunderstanding of mediation, which had developed based on personal interest and work experiences, guided my empirical data collection. After the audio and videodata was transferred to DVD format I familiarized myself with the data. I watched the videos several times and made notes on them. I made general analysis of the lessons (See Appendix H). For further detailed analysis of the videodata I tried ELAN linguistic software to create annotations to video streams of the observed data. The tool provided different views on the annotations, but I found it did not

to suit my analysis purposes, so I typed teachers' speech and students' speech manually in Word from the audio recordings of the videos. I added timecodes and non-verbal actions of teachers after I reviewed the videos. The level of detail of the transcript developed during the typing process. Heath and Luff explain (2008, p. 497) that in transcripts the length of pauses and silences can be captured in a tenth of a second or two tenths of a second, but the level of such detail has not been used in mediation studies, and I did not find it necessary to go into such detail in this study either. I used teachers' verbal actions, spoken words, statements and vocal sounds and non-verbal actions, which I was able to observe, hear or see, as the utterances and actions for my analysis.

I coded the teachers into sequence T1 (Teacher 1), T2 (Teacher 2), T3 (Teacher 3), T4 (Teacher 4), T5 (Teacher 5) and T6 (Teacher 6). Their students were coded S1 (Student 1) – S24 (Student 24). I used code S for students' talk if I was unable to name the student who was speaking. I cross-checked the audio, text, transcripts and videos several times. In the analysis, I omitted my interventions in the lessons to check the operation of the cameras, since the teachers could regain the attention of the children without delay and my visits did not stop any of the activities. I continued the data analysis in a Word table with five columns. See Table 8 below.

Table 8. Videodata analysis

1. Time	2. Transcript	3. Descriptive reduction	4. Core idea	5. MLE/RM category
Episode 2.2	**T2: Today we investigate the number ten.** S6: I. Easy. *T6 draws the number in the air.*	Explains Enforces explanation	Explains the intention of the lesson student should focus on. Enforces intentionality	INT
	T2: Is it an easy number? **T2:** Mmmm. **T2:** You know it. S: Yes.	Asks Confirms Explains	Reacts to the move initiated by Student 6.	RECIP RECIP RECIP
	T2: But we investigate now such a number as ten and I give you first these *T2 turns to get some egg cartons* **egg cartons.**	Explains Explains Handling material	Explains intention of the lesson student should focus on. Provides meaning to own doing Handling didactic material	**INT** **MP own doing** **RM**
	T2: You… *T2 hands S6 an egg carton* **…have used these before.**	Explains Handling material	Transcendence to previous experience Handling didactic material	**TRANS** **RM**

The *first column*, time, indicated time and sequence of didactic periods and episodes of the lessons. I detected the didactic period based on didactic grounds. I followed the example of Leiwo et al. and used the content and didactic teaching objectives to detect the episodes, which formed the didactic period. Change of

didactic teaching objectives, which were apparent in the teachers' actions or change of material being used, I considered to be a change of an episode.

In the *second column* of the analysis table, I placed the transcript of the lesson. I color coded teachers' actions according to MLE parameters. Theory and method have a large say in calling something an 'action' in the first place, and what counts as evidence for that action (Antaki 2008, pp. 432). Actions which did not fit the MLE parameters I left black. They formed a separate category, which I later named resource management (RM). The coding unit was teachers' verbal utterance or non-verbal action which was possible to detect as a meaningful unit. In the *third column*, descriptive reduction, I named the verbal and non-verbal action of the teacher next to the segment of the transcribed text. I asked, "What is the teacher doing?". In the *fourth column*, Core idea, I explained the meaning of the action. During the process, the research questions and MLE parameters guided my thinking.

To infer meaning I needed to consider simultaneously the time, transcript, reduction and context with an analysis of the word meanings of the teachers. If ambiguities existed, I consulted the video material for contextual clues. Distinguishing the utterances within the context of episodes, cycles and moves helped in providing them with meaning. As Stake argues, "The search for meaning often is a search for patterns, for consistency, for consistency within certain conditions, which we call 'correspondence'" (Stake 1995, p. 78).

In the *fifth column*, MLE/RM, I coded the action and its core idea next to the appropriate segments with abbreviations of mediation parameters; INT for intentionality, RECIP for reciprocity, MP for meaning provision, MR for meaning request, TRANS for transcendence, FC for feeling of competence, CB for regulation and control of behavior and RM for resource management. I used the color codes from the transcript column as preliminary codings and compared them with the codings in the MLE column. The coding of the MLE parameter concepts followed the description, which I present in Table 9.

Table 9. Description system of MLE interaction and resource management

Concept	Description of the concept	Empirical example	Criteria how it is detected in the data
Intentionality (INT)	Teacher's communication of what to focus on in the didactic unit or episode	T3: *Boys, we're starting to do preschool work.* T6: *Then we're going to do some English.*	When the teacher tells what the goal of the didactic unit or episode.
Reciprocity (RECIP)	Teacher's response to a student-initiated move	S: *Now I'm going to trace this.* T6: *Right.*	When the teacher reacts to student initiation.
Meaning provision (MP)	Expression of value	T5: *And this book is about pasta and pizza.* T1: *Quite a…* T1: *Not my favorite animal.*	When the teacher names a thing or matter or tells the worth of matters.
Meaning request (MR)	Request for value	T5: *What color is this?*	When the teacher asks a student to name or state why, what for.
Transcend-ence (TRANS)	Widening the interaction beyond the elementary goal	*T3: That has been…* T3 points with her finger. *T3: practiced before.*	When the teacher expands beyond what is functional.
Feeling of competence (FC)	Interpretation of the competence of students	T3: Yes. T3 nods. *T3: Exactly.* T4 laughs. T4: *Lovely!*	When the teacher communicates students' success verbally or non-verbally.
Regulation and control of behavior (CB)	Inhibition and initiation of student behavior	T5: *Wet your brush nicely.* T2: *Then, listen.*	When the teacher tells students what to do or how.
Resource management (RM)	Management of teaching and learning material or the work facility	T3 closes the door. T2 picks up the cubes from the table and puts them away.	When the teacher organizes the classroom or manipulates or handles material needed for teaching, studying and learning.

Intentionality

To detect intentionality in the lesson, I examined how the teacher made students aware of the goal of the lesson and the focus of attention. The nature of expressing intentionality seemed multidimensional. The first question which appeared in relation to intentionality was the degree of involving students in stating the goal. Was the goal stated by the teacher or did she involve students in it? Next, the degree of unambiguousness caught my attention. It appeared that sometimes teachers stated the intentions unambiguously, whereas sometimes they left more room for interpretation. When I analyzed the expressed intentions further, I noticed that teachers requested different kinds of actions from students. This led me

to differentiate learning-related intentions from make-believe intentions. I also noticed that teachers stated the goals before the activity, after it and extended some goals to a later time in the future. See Table 10 for dimensions of intentionality.

Table 10. Dimensions of intentionality

Dimension	**Description of the dimension**	**Empirical example**	**Criteria how it is detected in the data**
Teacher stated	Goal of the didactic unit or episode communicated by the teacher	T1: Hey, now we have Floor Story.	When the teacher tells the goal to the students.
Reciprocal setting of goals	Goal of the didactic unit or episode requested by a student or teacher involving students in stating the intention	T2: *Do you know what we are practicing today?* S: *Mmmm.* S: *What are we going to do then?* T6: *Then we're going to do some English.*	When a teacher asks the students what the goal is or when a student asks what the goal is, and the teacher answers the question.
General	Goal of the didactic unit or episode expressed in a general manner	T2: *You may come to a little preschool session* T1: *Then we start our work.* T1: *Let's see what we accomplish.*	When the teacher states the goal so that it remains implicit.
Specific	Goal of the didactic unit or episode expressed in a specific manner, with a specific task or goal	T4: *Your task is to put these cards in time sequence.*	When the teacher states the goal so that it becomes explicit.
Learning	Goal of the didactic unit or episode communicated as a goal to be learnt, practiced, investigated or thought	T5: We are going to learn to follow instructions in order to make something.	When the teacher says what the students are to learn or what they are practicing, investigating or thinking
Make-believe	Goal of the didactic unit or episode communicated as a pretend, make-believe goal	T4: *Good morning and welcome to a fun journey to preschool!*	When the teacher says what students are to imagine or pretend.
Pre-activity	Goal of the didactic unit or episode communicated before students begin the task or activity.	*T5: Today we are going to learn about colors.* Points to the writing on the blackboard. *T5: And we're going to use the primary color to make secondary color.*	When the teacher tells the goal before the activity.
Post-activity	Goal of the didactic unit or episode communicated after students finish the activity or task.	T4: *So now we're thinking about heavy and light.*	When the teacher tells the goal after the activity.
Future-oriented	Goal set for a task in the future	T6: We have to take the family reading (...in the next lesson).	When the teacher tells the goal for a lesson in the future.

Reciprocity

I considered reciprocity related to teachers' actions which reflected a reaction to students' moves. I found the reactions to student-initiated communication to form two main categories: verbal and nonverbal. The verbal category included eight subcategories. See Table 11 and Table 12.

Table 11. Types of verbal reciprocity

Category	**Description of the category**	**Empirical example**	**Criteria how it is detected in the data**
1. Verbal reaction, comment or confirming	Reacting verbally, commenting or confirming student initiation	S: *Now I'm going to trace this.* T6: *Right.*	When the teacher responds verbally to a student's comment.
2. Answering a student's question	Responding to a question asked by a student	S: *May I look at the other (worksheet)?* T6: *Yes, you may look at the model.*	When the teacher answers a student's question.
3. Asking a question related to the student's story	Reacting by asking a question	S: *We were ice fishing on winter break.* T6: *Did you catch any fish?*	When the teacher asks a question related to a student's statement.
4. Repetition of a student's comment or answer	Repeating a comment or answer given by a student	S1: *And then you were left with the magic cloth.* T1: *I was left with the magic cloth.*	When the teacher repeats what the student has said.
5. Rephrasing child's talk or providing a word	Helping the student to be understood by others	S: *I saw in Muuminland once a ….* T2: *A crow.* S: *It was…*	When the teacher helps a student rephrase talk or gives a word for the student to continue talking so others understand.
6. Continues telling something about the topic the student brought up	Further exploration of student-initiated topic	S: *Well mud clothes can get dirty and wet.* T1: *Yes, they can. And they're easy to wash. And you can play rough with them there (in the forest).*	When the teacher tells more about a topic a student brought up.
7. By request instructs a child	Provision of help when requested by a student	S: *I don't get the green color to show.* T6: *If you go… can you go flat this way as well as horizontal?*	When the teacher helps a student when she or he has asked for help.
8. Other	Other type of verbal reaction to student initiation	S1 shows a drawing to T1. T1: *Oh, you've drawn a pine tree.*	When a student demonstrates initiation in other ways than verbally, and the teacher reacts to this.

Table 12. Types of non-verbal reciprocity

Category	Description of the category	Empirical example	Criteria how it is detected in the data
Non-verbal nodding, looking, stopping to listen	Reacting non-verbally to a student's initiative	*S23: Once when we were.* T6 pauses to look at S23. *S23: At Midsummer with my uncle. So, there were cookies on the table. So, my little brother went to take a lot of them and went under the table.*	When the teacher uses non-verbal means to react to a student's initiatives.

I did not include students' questions related to the intentions in the category of reciprocity but coded them in the category of Intentionality.

Meaning

Coding of expressions of meaning was based on the expressions of worth of matters being studied. How did teachers bring out the value of matters being worked on? How did they express affect, interest or enthusiasm? It appeared that labeling items, naming matters and requesting children to name matters (see also Klein 1987, p. 117) was given much class time, and thus was considered valuable in the classroom. In coding, I differentiated content meaning and cognitive meaning (see also Haywood 2000, p. 300). Meaning and value was expressed verbally or nonverbally. See Table 13 and Table 14.

Table 13. Types of provision of meaning

Category	Description of the category	Empirical example	Criteria how it is detected in the data
1. Naming	Identification by name	T5: *And this book is about pasta and pizza.*	When the teacher names a concrete or abstract thing.
2. Non-verbal provision of meaning	Movement of hand, finger, head or other in conjunction with provision of meaning	T5: *We're going to count forward.* T5 points from left to right on the stick.	When the teacher uses non-verbal means in conjunction of naming a concrete or abstract thing.
3. Imitating or modeling	Identification by showing	T1 models with the finger how to draw the letter O in the exercise book.	When the teacher imitates the proper way of doing something or models it for students.
4. Naming own doing	Identification of teacher's own actions	T5: *So, I've brought a few books.*	When the teacher tells what she is doing or has done.
5. Expression of affect or personal attitude	Identification by personal value	T1: *Not my favorite animal.*	When the teacher gives her personal opinion.
6. Cognitive meaning	Identification of reason, strategy, generalization or conclusion	T1: *It will not show there then.*	When the teacher explains why or what for, makes a generalization or names a strategy for work or conclusion.

Table 14. The types of request for meaning

Category	Description of the category	Empirical example	Criteria how it is detected in the data
1. Request to name	Request to give meaning	T5: *What color is this?* S20: *Yellow*.	When the teacher asks a question which students answer by naming a thing or matter.
2. Non-verbal request for meaning	Request to give meaning presented non-verbally	T5 points to yellow.	When the teacher uses non-verbal means in conjunction of requesting students to name a concrete or abstract thing.
3. Request to answer yes-no	Request to react to a matter with meaning	T5: *Can you see the wheel over here?*	When the teacher asks a question which the students answer with yes or no.
4. Cognitive meaning	Request to provide meaning which calls for elaboration of strategy, reason, opinion or what if thinking	T2: *How can it be right?* T3: *How can you know if there are as many of them?*	When the teacher asks students to name a way to do something, a reason why or what for, tell their opinion, name a strategy, tell what if.

Transcendence

I coded transcendence as the orientation of the teacher to widen the interaction beyond the immediate primary and elementary goal. To infer transcendence from interaction I considered content transcendence and cognitive transcendence. Content transcendence was about the teacher pointing to other situations where similar content had been present or experienced by the children. Cognitive transcendence referred to thinking processes, memory, general rules which the teacher referred to. See Table 15.

Table 15. Types of transcendence

Category	Description of the category	Empirical example	Criteria how it is detected in the data
1. Recalling	Widening interaction in reference to memory	T3: *That has been practiced before.*	When the teacher expands and says that something has been done before.
2. Content	Widening interaction in reference to similar content	T4: *We've been there on a field trip.*	When the teacher expands and says that similar content has been studied before.
3. Strategy	Widening interaction in reference to a strategy used before	T3: *In the same way of thinking.*	When the teacher expands and says that the strategy needed has been used before.

Feeling of competence

I considered feeling of competence as teachers' interpretations of mastery and competence of students. It was my interest to find out how teachers make students aware of their competence. I considered both verbal and nonverbal means. See Table 16.

Table 16. The types of communication of a feeling of competence

Category	Description of the category	Empirical example	Criteria how it is detected in the data
1. Verbal reaction or repetition of answer	Verbal confirmation of student's success	Children thumbs-up. ***T3: Yes.***	When the teacher accepts a student's answer by reacting to it verbally or repeating it.
2. Statement	Confirmation of student's success with a statement	T5: *Well done.*	When the teacher gives students positive feedback.
3. Nodding	Non-verbal confirmation of a student's success	Children thumbs-up. *T3: Yes.* **T3 nods.**	When the teacher gives students positive feedback by nodding.
4. Statement with explanation	Explanation of a student's success	T5 stands behind S19 observing S19 work. T5: *Good.* T5: *Well done.* **T5: *You're really careful about the line.***	When the teacher explains what is good about a student's performance.
5. Laughter	Demonstration of satisfaction with the class	S13: *I like the stickiness of this.* S13: *This brings good luck.* T4: *How do you know that it brings good luck?* S13: *I think this is so much fun.* **T4 laughs.**	When the teacher laughs in class and laughter is connected to satisfaction with the students or their work.

Regulation and control of behavior

For coding regulation and control of behavior I observed the interaction and asked, "How does the teacher control and initiate behavior?" I identified 11 categories of actions for regulation and control of behavior in class. See Table 17.

Table 17. Types of regulation and control of behavior

Category	Description of the category	Empirical example	Criteria how it is detected in the data
1. Instruction of what to do	Regulation of students by instructing them what to do	T5: *Wet your brush nicely.*	When the teacher tells students what to do.
2. Indication of turns	Initiation of student behavior by giving them a turn	T3 points to S11.	When the teacher tells or non-verbally indicates whose turn it is.
3. Monitoring student work	Regulation of student behavior by monitoring their work	T4 observes when S16 traces letter A.	When the teacher observes what and how students are working.
4. Non-verbal enhancement with hand, touch, source, modeling or look	Regulation and control of behavior non-verbally or enhancement of it non-verbally	T5: *Use the brush this way.* **T5 Demonstrates how to use the brush.**	When the teacher non-verbally regulates student work.
5. Call for attention (look, listen)	Regulation of attention	T2: *Then, listen.*	When the teacher asks students to look or listen.
6. Regulation and control of behavior in relation of time (wait, start, now)	Regulation and control of behavior regarding time	**T2: Now.** Then it says that "How many syllables do you hear?"	When the teacher asks students to begin or delay action.
7. Explaining how to do something.	Regulation and control of behavior regarding how to do something	**T4: We don't go this way.** *T4 moves student's hand from right to left.* **T4: But we go this way.** *T4 moves student's hand from left to right*	When the teacher explains how to do something.
8. Regulate impulsivity	Regulation and control of behavior regarding impulsivity	T2: *S8, if you're that fast don't say (the answer) aloud so that all the others don't then…*	When the teacher regulates a student's tendency to act on a whim.
9. Regulation and control of behavior in relation of incorrect answer	Regulation and control of behavior regarding wrong answers	T4: A beaver builds a dam. *T4 reads a rhyme card.* T4: Tom seeks for? T4: S16? S16: Ham. **T4: No.** T4: Tom seeks for? S15? S15: Sam.	When the teacher indicates that a student's answer was wrong.
10. Regulation and control of behavior in relation to school rules, noise level, sitting properly	Regulation and control of behavior in relation of school rules	S1: …… *T1 puts her finger on her mouth.* **T1: When we work, we're quiet.**	When the teacher asks students to quieten down, follow school rules or sit properly in their chairs.
11. Request to help teacher	Regulation and control of behavior in relation to fulfilling a common need in class	T6: *S22, could you get paper towels for all of you there*.	When the teacher asks a student to provide help in a task which will benefit the students.

Resource management

I used thematic analysis (Castle 2012, pp. 113-122) for analyzing interaction which did not follow the MLE parameters**.** I named it resource management (RM) since it contained management of the context or material relevant to the lesson. Examples of teachers' resource management actions include actions such as taking a piece of chalk, walking over to turn on the radio, walking back to turn off the radio, putting a book down, setting a roll of paper on the table, closing a window, closing a door, moving a poster, piling books, distributing worksheets or books to the children, picking up a basket and putting a basket down. See Table 18.

Table 18. Types of resource management

Category	**Description of the category**	**Empirical example**	**Criteria how it is detected in the data**
Didactic item management	Managing items to motivate children or to make a point in teaching-studying-learning	T2 opens her hand to show the number of pearls.	When the teacher manipulates an item to teach something.
Content material management	Managing content related material	T1 passes worksheets to S1, S2, S3, S4.	When the teacher passes or receives worksheets, books or notebooks. When the teacher opens, closes, reads and handles teacher's manuals.
Management of items related to students' studying and learning	Managing items related to students' studying and learning	T3 moves student's sharpener on the table.	When the teacher moves, picks up or puts down items which students use for studying and learning.
Context management	Managing immaterial and material aspects of the lesson and classroom	T3 closes the door.	When the teacher moves in the classroom to get something or return something. When the teacher keeps track of time. When the teacher moves furniture or opens or closes a window or door.

Identifying utterances and non-verbal communication of the teacher was a highly interpretative process where the communication analysis fused with information derived from the video observation, interview material and teacher questionnaire. Analysis is a matter of giving meaning to first impressions as well as to final compilations. As Stake comments, "The quantitative side of me looked for the emergence of meaning from the repetition of phenomena. The qualitative side of me looked for the emergence of meaning in the single instance "(Stake 1995, p. 76).

In coding the transcripts, I used triangulation which was to reduce the likelihood of misinterpretations. I asked two Bright Start-trained co-analyzers to analyze ten utterances of transcribed video data each. The rate of accuracy was between 85% to 90%. In qualitative casework researchers may employ triangulation – a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation (Stake 2000, p. 443). I wrote insights which appeared during coding and analysis in the last column of the data analysis table. But as the number of insights increased, I moved the notes to a separate document.

Graphical representation of data

I found it important to point out the number of identified units of mediation parameter appearances in the data. I calculated the sums and percentages for intentionality, reciprocity, meaning, transcendence, feeling of competence, regulation, and control of behavior and resource management actions. The numbers abled me to illustrate variation within-case and cross-case appearance of mediation. They also allowed me to organize the data in a frequency distribution table to provide information about the appearance of MLE parameters and resource management and their relationships in interaction. Case researchers seek both what is common and what is particular about a case (Stake 2000, p. 438). The data was time normalized to 30-minute lessons. Rescaling of the data led to all values being within the same range of 0 and 1, and values which had a larger scale were not given increased weight. See Appendix H. I present the results of the video data in sections 5.1.1 to 5.1.7.

4.5.2 Analysis of teacher interviews

I organized the interview data by converting it into text. I listened to the interview tapes several times. I continued the analysis process for finding the meanings and leading thoughts which teachers gave to the matters relevant in this study. This was a reflective conversation with the text in which I and the text interacted in relation to the research questions. I separated the relevant from the irrelevant and reduced teachers' answers to sentences. I set the reduced text in a table with my questions written in the left column and teachers' answers in the columns to the right. See Table 19 below.

Table 19. Interview data analysis

Interview question	Reduced T1 answers	Reduced T2 answers	Reduced T3 answers	Reduced T4 answers	Reduced T5 answers	Reduced T6 answers
1. The task of preschool education/primary school education						

Reading the rows allowed me to compare the answers between teachers. Reading the columns gave me an overall idea of how each teacher differentiated aspects of education. Reading and further use of content analysis (Tuomi & Sarajärvi 2018, 2009) helped me to differentiate teachers' viewpoints which to me represented action-level pedagogical thinking as teachers described practices in relation to cognitive education. See the criteria stated on teacher's pedagogical-level thinking in chapter 2.4. Some teachers occasionally reflected awareness of theoretical criteria of enhancement of cognitive functions at the object theory level such as T2 and T3 in the following quotes as they step back from aspects of cognitive education and look at it as an object:

> *I think that learning cannot take place without interaction. It must be there.*
> T2 Initial interview

> *Intelligence is inherited, and one cannot influence it. Skills can be practiced.*
> T2 Initial interview

> *You might be able to influence intelligence. If you teach badly or don't understand the child might regress.*
> T3 Initial interview

But no teacher shared a vision of cognitive education, awareness of the history, values or philosophical underpinnings which demonstrates metatheory-level thinking according to the pedagogical-level thinking model (Kansanen et al. 2000, p. 25; Kansanen 2004, pp. 97-98). I decided to continue reading the data for repetitions and patterns to find core words which I bolded in the text. My analysis unit was an utterance. I felt a need to examine the data one question at a time, so I placed the answers in a new table. See Table 20.

Table 20. Reduced empirical examples of interview data and concept clusters

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
The task of preschool education/ first grade education	***Basics for learning to read*** *at school. Should be* ***skillful to do exercises****. To learn to read is not important but the* ***social side*** *is. To know how to function in a group, waiting for a turn, taking care of one's own belongings, interaction with others.* T1 Initial interview	Basic knowledge Skills to do exercises and function socially	Supports the intellective aspect of cognitive education.
	Good self-esteem and learning motivation *with a feeling that I learn, and learning is fun.*	Self-esteem, Motivation	Supports the non-intellective aspect of cognitive education.
	Offering a ***special year of being the kings****, a little extra. They are the oldest who get some privileges and such.* T2 Initial interview	Developmental task	Supports non-intellective aspect of cognitive education
	School subjects and subject specific work methods *observation, prediction, classifying, shapes.*	School subjects Learning to learn skills.	Supports intellective cognitive education.
	To become a ***student****. Managing routines, taking care of tasks, belongings, and moving from one place to another.* ***Social skills****, respect for others and team spirit.* T6 Initial interview	Student identity Social skills	Supports intellective cognitive education Supports intellective cognitive education

In the left column I placed the interview questions. In the following column I collected the reduced empirical expressions with bolded core words. I analyzed the bolded words in their own terms, data based (Tuomi & Sarajärvi 2018, p. 133), to form concept clusters in the third column as aspects of pedagogical thinking. Instead of the pedagogical level of thinking I reflected on the concept clusters within MLE theory and how they were in line with cognitive education which I presented in sections 2.1 and 2.3. I stated whether the concept clusters supported the intellective aspect of cognitive education, that is whether the teacher described knowledge, understanding, operations or strategies for thinking. I also stated whether the concept clusters supported the non-intellective aspect of cognitive education, that is whether the teacher described habits, attitudes, motives, dispositions or the will to do things or whether the thinking demonstrated features of cognitive education but lacked some aspects of it and therefore demonstrated partial opportunity for

mediation, that is whether the teacher described intellective, non-intellective or conative dimensions of cognitive education or mediational teaching partially. In addition, I stated if the thinking did not support cognitive education, that is whether the teacher was unable to describe her thoughts on cognitive education or mediational teaching. See Table 21 for description of the categories, empirical examples and criteria how I categorized the data.

Table 21. Pedagogical thinking and its support of cognitive education

Category	Description of the category	Empirical example	Criteria how it is detected in the data
Supports intellective aspect of cognitive education	Teacher's utterance demonstrates education of knowledge, understanding, operations, and strategies for thinking.	*"**Basics for reading** at school."* Initial interview	When the teacher describes knowledge, understanding, operations or strategies for thinking
Supports non-intellective aspect of cognitive education	Teacher's utterance demonstrates education of habits, attitudes, motives or dispositions to do things.	*"**Good self-esteem** and learning **motivation** with a **feeling** that I'm learning, and learning is **fun**."* Initial interview	When the teacher describes habits, attitudes, motives, dispositions or the will to do things.
Supports cognitive education partially	Teacher's utterance contains some but lacks some intellective or non-intellective dimension of cognitive functions or MLE parameters of mediation.	*"You can guide and wake up [thinking] **with questions**."* Initial interview	When the teacher describes intellective, non-intellective or conative dimensions of cognitive education or mediation partially.
Does not support cognitive education	Teacher's utterance does not include intellective, non-intellective or conative dimensions of cognitive functions or any MLE parameters.	*"I **don't know**."* Initial interview	When the teacher is unable to describe her thoughts on cognitive education or mediation.

In coding and analysis of the interview data I used triangulation. I asked a co-analyzer to analyze ten randomly picked answers by different teachers. The rate of accuracy between myself and the co-analyzer was 80%. My analysis of the interview data followed the approaches to qualitative data analysis (Castle 2012, pp. 113-122). I did not use respondent analysis of the constructs. In other words, I used my own reflections on how teachers' communication on education and cognitive aspects of it addressed cognitive interaction. Stimulated recall might have increased the understanding of teachers' pedagogical expertise, but as Castle reminds us, reading is not an attempt to find ultimate truth but rather to find some insights that can be used to address the research questions. Similarly, I considered that my analysis was sufficient to produce insight into teachers' thinking as I was not aiming to find the ultimate truth of the teachers' pedagogical thinking but insights

to develop an understanding of it. In qualitative data there is always the question of how many readings are needed. Castle says that reading should continue until no new patterns, themes, insights, or interpretations emerge. I reached the saturation point when my reading of the data for meaning yielded no new themes. I report the interview results in section 5.3.

The final text of this research was produced ten years after the data production took place in 2008-2009. I was able to begin the data handling and analysis right after the data collection. I continued it while working full-time as a class teacher. I feel the time between the data production and the final thesis, even though long, has not affected the results of the study. To my knowledge, no national teacher training for the MLE parameters has been provided during this time in Finland. The 2014 curriculum set the thinking skills and learning to learn as transversal competencies. It is likely that the teachers are more aware of the concepts but based on the judgement of my colleagues and myself, teachers are still in the process of finding practices to implement the curriculum. A few municipalities have offered Bright Start training for their teaching staff, but in general it is very likely that the results of the study apply in the current classrooms.

5 RESULTS

I present the findings in three parts. First, I describe how teachers' actions reflected MLE theory and resource management. I include selected quotes of transcriptions which are in a non-technical form with conventional punctuation. I adapted the presentation from Mercer (2000). I use codes for the teachers: T1 (Teacher 1), T2 (Teacher 2), T3 (Teacher 3), T4 (Teacher 4), T5 (Teacher 5) and T6 (Teacher 6) and numbers for the videotaped lessons by months September=1, November=2 and February=3. I state the setting at the end of the quote. In addition, I use a reference to the didactic unit or episode when I quote expressions of intentions.

In the second part of my results, section 5.2, I present the variation of the actions and show how the mediation and resource management differed in amounts between teachers and the months of September, November and February. I present tables and figures to illustrate the results. In section 5.3 I present the third part of the results: teachers' pedagogical thinking on cognitive education, classroom interaction and mediation.

5.1 Teachers' actions reflecting mediation and resource management

In all, teachers' actions reflected mediation in intentionality and reciprocity, mediation for meaning, mediation for transcendence, mediation for a feeling of competence and mediation for regulation and control of behavior. I identified contrasting actions, some of which clearly reflected mediation and others which included features of mediation but did not reflect it systematically. When I examined the actions further, I was able to identify teachers' actions in each parameter in more detail. In addition, I was able to identify a category of teachers' actions which did not follow the MLE parameters. The category, resource management, supplemented the mediation findings. The qualitative difference between mediation and resource management actions stems from the first being more directly related to the enhancement of cognitive functions while the latter is more or less indirectly related and primarily focuses on creating the context for teaching-studying and learning. I describe the dynamics of mediation in each parameter in figures and provide sections of key examples when introducing the results.

5.1.1 Intentionality

To convey a purposeful and directed interaction, teachers communicated their intentions to students verbally and in writing. To have students experience, observe and perceive matters intended for their studying and learning, teachers shared intentions with them in various ways. Intentions were mainly stated by the teachers, but some reciprocal setting of goals appeared. Students accepted the intentions set for the sessions. Sequence 1 demonstrates how a teacher expressed the intention independently. Sequences 2, 3 and 4 show how teachers used reciprocity to set the goal for the lesson.

Sequence 1: T4 moves chairs and points for students to take their seats. T4 asks students to sit down. T4 gets a chair for herself.

1. T4: *Let's begin with physical exercise.*
2. Students stand up.
3. T4 goes to the tape recorder.
   T4.1.1

T4's intention statement (Line 1) demonstrates how she stated the intention for the episode of the lesson. T4 began the lesson with physical movement, which was accompanied with music. No reciprocity was used for stating the intention. Students accepted the intention without reservation by standing up (Line 2).

Sequence 2 demonstrates how the teacher used reciprocity for setting the goal for the lesson.

Sequence 2: Students are working on preschool book exercises. They have reached the last task of the lesson. T1 asks the students what letter they will be practicing during the last episode of the lesson.

1. T1: *And now the last task.*
2. T1: *What letter are we practicing now?*
3. T1 points to the page of her book
4. T1: *S2?*
5. S2: *O.*
6. T1: *O.*
7. T1: *So now you get to do there…*
8. T1 looks at the picture in her book
9. T1: *…inside the apple…*
10. T1 turns to look for a piece of chalk
11. T1: *…letter O.*
    T1.2.3

T1 asked students if they knew what the intention was (Line 2). S2 answered that they would be practicing the letter O (Line 5). T1 repeated the answer and confirmed that the intention of the last episode of the lesson was to practice the letter O. The intention was formulated with some reciprocity between T1 and S2.

Sequence 3 demonstrates how the teacher used reciprocity to set the goal for the lesson.

Sequence 3: T3 asks students to take their seats at a table. T3 leaves the room and returns with a ball in her hand. T3 moves items on the table.

1. S: *Why is there a ball there?*
2. T3: *I'll tell you as soon as you sit down why I have a ball.*
3. S: *Ball. I've only sharpened these pencils once since I got them.*
4. T3: *Now we're going to do an exercise that came to my mind here. We're going to think about, erm, what as many or not as many means.*
5. T3: *So, we do so that I ask you, for example, are there as many?*
6. T3: *Are there as many claps?*
7. T3: *Or when the ball bounces and you hear this kind of a sound.*
8. T3 bounces the ball twice.
9. T3*: So, you can…*
10. T3*: How many bounces were there now?*
11. S: *Two.*
12. T3: *Two.*

T3.2.1

S asked T3 why there was a ball [on the table]. See Line 1. T3 answered the student (Line 2) that she would give the reason when the student had sat down. T3 defined the intention of the lesson (Line 4) to be an exercise where they were going to think about what is as many and not as many. T3 used the ball so students could compare the number of bounces. Reciprocity in sharing the intention of the lesson appeared between T3 and S. S asked T3 a question related to an item which referred to the intention.

Sequence 4 shows how the teacher used reciprocity to set the goal of the lesson.

Sequence 4: T6 is finishing the first tasks of the lesson with her group. She asks students to wipe the boards they were using for Math exercises and put their markers down. S asks T6 what they were going to do next.

1. T6 puts the top on S23 marker and sets it on the desk.
2. T6 puts the top on S22 marker and sets it on the desk.
3. S: *What are we going to do then?*
4. T6: *We are going to do some English.*
5. T6: *Today too.*
6. T6: *Both Math and English.*
7. T6: *Alright.*
8. T6: *I am going to take these boards aside.*
9. T6 takes S23 board and moves it behind her.
10. T6: *We don't need them anymore.*
    T6.2.2

A student asked T6 what they were going to do next (Line 3). T6 named the school subject, English, as the intention for the last part of the lesson (Line 4). S demonstrated goal awareness and wanted to know what was happening next. The intention was communicated in reciprocal interaction between S and T6.

Teachers expressed the intention of the lesson with varying levels of detail and depth. I defined intentionality in terms of a general to specific continuum. Sequences 5 and 6 show how the teachers indicated the intention in a general manner and Sequence 7 illustrates a specific way to communicate the intention.

Sequence 5: T2 is standing by the door of the classroom and waiting for the students to come in. Four students are approaching the door.

1. T2: *You may come to a little preschool session.*
2. S7: *I hate that.*
3. T2: *Why?*
4. T2: *Oh, it would have been nice to be outdoors.*
5. T2: *You like to play, don't you?*
6. T2: *The snow is so nice now.*
7. T2: *You're so sweaty S7.*
8. T2: *You may go in there.*
    T2.3.1

T2 communicated that it was time for a preschool session (Line 1). T2 did not explain what the students were going to do or study. The sequence demonstrates how T2 made students aware of what was being done in the lesson in a general manner.

Sequence 6: T1 is about to start the preschool session. T1 picks up the teacher's manual and browses through it. Students sit down at a table with their preschool books and pencil cases.

1. T1: *Then we start our work.*
2. T1: *Let's see what we accomplish.*
3. T1: *So, open your books on page…*
4. T1 looks at the opening of an exercise book.
5. T1: *…60-61.*
6. T1 shows the opening to the children.
7. Laughter.
8. S2: *Hmm, not this page.*
9. T1: *No.*
10. T1: *It was completed.*
11. T1: *Quite logically the next page.*
12. S1: *Quite logically.*
13. S: *I haven't done it.*
14. T1: *Why haven't you done it?*
15. S: *Because I was absent.*
16. T1: *You were absent then.*
17. T1: *That's ok.*
18. T1: *But you move on to the next page.*
19. T1: *Yes.*
20. T1: *So, first, let's look at page 60.*

T1.3.1

T1 told the students that they were starting their work (Line 1). T1 expressed non-specifically what her intention for the lesson was (Lines 1-2). T1 wondered what they were going to accomplish during the lesson. The statements communicated non-specific intention. When teachers communicate the intention in a general manner it is not easy for students to know what is expected of them.

More specifically communicated intentions appeared when teachers named the topic of the lesson, task or exercise at hand or let the students know what the goal of their work was. In the following episode, T4 communicated the intention of the episode in a specific manner.

Sequence 7: T4 pairs the students and shows them packs of cards. She explains what the students are to do with the cards.

1. T4: *S14 and S15.*
2. T4: *And S13 and S16 are partners.*
3. T4: *And now there is a different, there are different kinds of cards.*
4. T4 points to the table.
5. S: *Mmm.*
6. T4: *Your task is there in groups, that is, together with your partner to take one pack.*
7. T4 points to the table.
8. T4: *From the table and look at the cards.*
9. T4 models how to look at the cards.
10. T4: *Aha!*
11. T4: *What do these mean?*
12. T4: *Your task is to put these cards in time sequence.*
13. T4: *Do you remember what a time sequence is?*
14. T4: *S14?*

    T4.1.7

The intention of the teacher for this episode was to have students put the cards in time sequence with their partner (Line 12). T4 stated the intention of the episode specifically. It is easier for students to know what the teacher expects from them when the teacher states the intention in a precise manner.

Examples of specifically communicated intentions also included indications of a specific skill which would be practiced, such as counting and reciting numbers. Students also thought about specific matters, such as how different words are divided into syllables. Having students work with certain materials, equipment or art techniques were expressed as the specific intentions of teachers for the lessons. Teachers used non-verbal means, such as pointing, to emphasize their intentions.

The data showed that expressions of teachers' intentions appeared in a continuum of learning intentions to make-believe intentions. The following Sequence 8 is an example of a learning intention. Sequence 9 shows how the teacher used a make-believe intention.

Sequence 8: T5 points to students to take their places. T5 sits down, greets the students and asks about the weather before going to the intention of the lesson.

1. T5: *So, good morning*.
2. S: *Good morning*.
3. T5: *Ok, how was the weather outside?*
4. S: *It was fine*.
5. T5: *Was it cold?*
6. S: *No*.
7. T5: *Did you enjoy yourself?*
8. S: *Yes*.
9. T5: *Yes*.
10. T5: *All right*.
11. T5: *So today, our workshop is about instructions*.
12. T5 turns towards the blackboard.
13. T5: *Okay*.
14. T5: *So*.
15. T5 gets off her chair to read from the board.
16. *T5: We're going to learn to follow instructions in order to make something*.
17. T5: *So*.
18. T5: *Do you understand what instructions means?*
19. T5: *What do you understand by instructions?*
    T5.3.3

T5 expressed the goal of learning and the reason for it explicitly (Line 16). The students were learning to follow instructions to make something. The goal was stated as a learning goal.

Sequence 9: T4 tells students that they are going on a journey. T4 goes to turn the music on, and T4 sings a song with the students about how the room is left behind as they travel towards their destination on a train. After singing, the students sit down.

1. T4 goes to turn the music off.
2. T4: *Good morning and welcome to a fun journey to preschool!*
3. T4: *Today we're going to do fun things*.
4. T4 looks at the teacher's manual.
   T4.2.4

A fun journey to preschool, (Line 2), was indicated by T4 as the intention for the lesson. The journey is make-believe and calls for imagination as students and their teacher do not leave the premises.

In this data only T5 used the word learning to express her intentions. She was the only teacher who gave students a reason why something was important. No other teacher verbalized learning as intention or specified a particular reason why something was being practised or done in class. Other teachers' expressions implied learning when they expressed that students were going to do, work, practice or make something. This might be due to the curriculum and tradition of early childhood education in Finland to emphasize play and to take a non-academic approach.

The data also showed that the timing of communicating intentions varied. T5 wrote the intention of the lesson on the board before the lesson and pointed it out to the students at the beginning of the lesson. Some teachers verbalized the intention after an activity. Some teachers verbalized intentions which extended to the future. The future referred to a later time the same day, the following day or a later time further in the future. The following Sequence 10 demonstrates how the intention for the lesson was expressed after the activity.

Sequence 10: T4 brushes students' cheeks with feathers while soft music plays in the background. T4 passes feathers and cotton balls to students and asks them to drop them from the air. Students experiment with this. After a while T4 stops the music and discusses the observations with the students. She concludes the discussion by telling the intention of the lesson.

1. T4: *Is it heavier or lighter?*
2. S16: *I think it's as light.*
3. S: *I think so too.*
4. S15: *I don't.*
5. T4: *Ok.*
6. S15: *This is a little bit slower*
7. S16: *Yes, it floats.*
8. T4: *Yes.*
9. T4: *Okay.*
10. T4: Precisely.
11. T4: *So now we were thinking about heavy and light.*
    T4.3.3

T4 concludes that the intention of the lesson was to think about heavy and light (Line 11). T4 got students to experiment, collect personal perceptions and discuss their observations on how the feathers and cotton balls fell.

5.1.2 Reciprocity

Teachers reacted to students' initiatives during the lessons. Teachers responded to students' questions, talk or answers verbally and non-verbally. Teachers reacted verbally to students' initiatives with a single word such as "*right*" or "*yes*" or an oral approval such as "*mmm*". See the following sequence for a verbal reaction by T6.

Sequence 1: Four children are tracing fall leaves in Art lesson. They are sitting at their desks. T6 provides instructions for the work. A student tells the teacher what leaf the student is about to trace next. T6 reacts to the comment verbally.

1. T6: *Keep it over there.*
2. T6: *And press hard, please.*
3. T6 imitates coloring.
4. T6: *Okay.*
5. S: *Now I'm going to trace this.*
6. T6: *Right.*
7. S: *A different color.*
8. T6: *And S24, check that you have the veins (of the leaf) up this way.*
9. T6 demonstrates.
   T6.1

T6 reacted with the word "*right*" (Line 6) to a comment which was presented by a student. T6 demonstrated reciprocity by sharing the process of the student's coloring work.

Teachers answered students' questions or they asked questions related to the topic of a story a student told in class. See Sequences 2 and 3 as examples.

Sequence 2: T1 is distributing a second worksheet to the students. Students are instructed to write their name and the date on the worksheet. A student asks the teacher if they can look at the date from the previous worksheet which they had completed.

1. T1: *Now you get another worksheet.*
2. Teacher 1 passes the worksheets to S1, S2, S3 and S4.
3. T6: *Then again first there.*
4. T1 points to the bottom of a student's paper.
5. T6: *At the bottom of the paper with your pencil your name and the date.*
6. S: *Can I look at the other (worksheet)?*
7. T6: *Yes, you can look at the model.*
8. *T1 points to the date on the board.*

9. T6: *On the board.*
10. T6: *You may look at.*
11. T6: *You may look at your own work or the board (for a model).*
    T1.1

T1 answers a student's question (Line 7). Mutual questioning and answering enabled the student to adjust the actions according to the teacher's response.

Sequence 3: Students in T6 class are reading a book with their teacher. They discuss the seasons. A student shares an experience of ice fishing when winter is being discussed. T6 asks about the experience.

1. T6: *What is it?*
2. T6: *I mean the season.*
3. T6 circles the picture in the book with her finger.
4. S23: *Aah…winter.*
5. T6: *It's winter.*
6. T6: *Yes.*
7. T6: *And then he's cold.*
8. T6 points to the pictures in the book.
9. T6: *But he's still having fun.*
10. T6: *And S21, what did he make here?*
11. T6 circles a picture with her finger.
12. S21: *A snowman.*
13. T6: *He made a snowman.*
14. T6: *And still there.*
15. T6 points to the picture.
16. T6: *And he had to make this hole.*
17. T6 points to the picture.
18. T6: *In the ice with the saw.*
19. T6: *Okay.*
20. S: *We were ice fishing in the winter break.*
21. T6: *Did you catch any fish?*
22. T6 turns the page.
23. S: *No.*
24. *T6: It's tricky.*
25. *T6: And then.*
26. T6 shows the book again to the children.
    T6.3

T6 asked a question (Line 21) related to the experience shared by a student (Line 20). T6 wanted to know whether the student had caught any fish when fishing during the winter break. Empathetic listening and an opportunity for retrospection provided an opportunity for the student to bring a real-life experience into the classroom.

Teachers repeated students' comments to express verbal reciprocity. See Sequence 4 as an example.

Sequence 4: T1 is ending a story time with the students. Students name the characters of the story when they take turns to return the pictures to the teacher. One item, the tablecloth, is left to be put back. S1 comments that the magic tablecloth was left for the teacher.

1. T1: *Who?*
2. T1 points to the picture of the story character.
3. S3: *Simon.*
4. T1: *Simon.*
5. T1 puts the picture in the basket.
6. T1: *And S2.*
7. T1: *Now there are two choices.*
8. T1 receives the picture from S2.
9. T1: *Mary.*
10. T1 puts the picture in the basket.
11. T1: *And then, S1, what was left?*
12. S1: *The apple.*
13. T1: *The apple.*
14. T1 receives the picture from S1 and puts it in the basket.
15. T1: *Now we didn't have a real apple.*
16. T1 takes the tablecloth from the table.
17. S1: *And then you were left with the magic cloth.*
18. T1: *I was left with the magic cloth.*
19. T1 folds the tablecloth and puts it in the basket.
20. T1: *It is, on the one hand, quite fair that it is (left with the teacher) as there is always an argument always as everyone would like the magic cloth.*
    T1.2

T1 repeated a comment by S1 (Line 18). T1 also continued and further elaborated the topic of the comment in relation to the fairness of actions (Line 20).

Verbal reciprocal expressions also included rephrasing students' talk, continuing telling something about a topic introduced by a student and other actions, for

example instructing students when they requested teacher's help. Teachers expressed non-verbal reciprocity by nodding, looking at a student or pausing to listen to the student. Sequence 5 is an example of non-verbal reciprocal interaction between T6 and S23.

Sequence 5: The class is working on Mental Math problems. T6 gives the class the next task, which is related to cookies. S23 tells about an experience from the summer related to cookies, which T6 pauses to listen to.

1. T6: How many gingerbread cookies were left for Tom?
2. T6 looks at the children.
3. T6: *He made first eight, but his little brother ate four of them.*
4. T6: *How many left for Tom?*
5. T6: *Take your time to write down the answer.*
6. T6 reads the manual.
7. T6: *Okay.*
8. T6: *So S22, how many were left for Tom?*
9. S22: *Four.*
10. T6: *Four.*
11. T6: *Because the little brother ate half of them.*
12. T6 moves her hand down.
13. T6: *And he got only half left.*
14. T6: *Thank you.*
15. T6: *And once more you can wipe off.*
16. T6 puts her pencil on the desk.
17. T6 moves a marker from the edge to the middle of the desk.
18. S23: *Once when we were…*
19. T6 pauses to look at S23.
20. S23:*… at Midsummer with my uncle. There were cookies on the table. My little brother went to take a lot and went under the table.*
21. T6: *Okay.*
22. T6: *Now comes task number four, three.*
    T6.2

T6 paused to listen to S23 (Line 19). S23 had an opportunity to bring a personal experience into a Math lesson which did not, however, lead to further elaboration of it by the teacher (Lines 21-22).

5.1.3 Meaning

Teachers' expressions of meaning – the worth and value of matters, expressions of affect, interest and enthusiasm – appeared in labeling items, naming matters and requesting children to name matters. Both content meaning and cognitive meaning appeared. Teachers expressed meaning and value verbally or nonverbally and named things, items, characters and symbols. In the following Sequence 1, T5 named her own action and the book she had brought in class.

Sequence 1: T5 asked the students whether they remember having followed instructions to make something. Students share their experiences. T5 shows a recipe book to them.

1. T5: *So, I've brought a few books.*
2. T5 takes a book from the table.
3. T5: *It says eehh…that like S18 said that we, S18 had cooked, made a cake, and now we have here a recipe book, that you…*
4. T5: *It tells you how to make food.*
5. T5: *And this book is about pasta and pizza.*
6. T5: *How to make pasta and how to make pizza.*
7. T5: *I'm just going to show you only one picture, here.*
8. T5 opens a page in the book.
9. T5: *And it says pasta with green vegetables.*
10. T5: *And, ahh, do you see?*
11. T5 points to the picture.
12. T5: *The drawing shows the instructions well.*
    T5.3

T5 named her own action by telling the students that she has brought a few books (Line 1). T5 named her action again (Line 7). She provided meaning to the act of showing just one picture in the book. T5 provided meaning to the book by naming it a recipe book and naming the things the book is about (Lines 3, 4, 5, and 6).

Teachers used non-verbal actions such as showing an item when naming it or they pointed to objects when naming them with their finger, hand or head. In Sequence 2, T5 uses her finger when providing meaning by naming numbers.

Sequence 2: Students are learning counting, reading and writing numbers. They are counting numbers from zero to ten with T5, who points to the numbers on a number stick in front of the class when naming the numbers which are recited.

1. T5 takes a number stick from the table.
2. T5: *I'm going to use this number stick.*
3. T5: *And we'll pretend that here we have the number zero.*
4. T5 points to the end of the stick.
5. T5: *We're going to count forward.*
6. T5 points from left to right on the stick.
7. T5: *Up to ten and then backwards.*
8. T5 points from right to left on the stick.
9. T5: *Okay.*
10. S: *Okay.*
11. T5: *So, all together.*
12. S: *Zero.*
13. T5 points to zero.
14. T5 and S: *One.*
15. T5 points to number one.
16. T5 and S: *Two.*
17. T5 points to number two.
18. T5 and S: *Three.*
19. T5 points to number three.

T5.2

T5 pointed to the end of the number stick with her finger when naming it to represent zero (Line 4). In Line 6, T5 pointed from left to right on the stick when naming the direction of counting forward. T5 pointed from right to left on the number stick when naming the direction of counting backwards (Line 8). T5 continued to point when numbers were being recited (Lines 13, 15, 17 and 19).

Teachers provided meaning also by modeling a behavior or skill or imitating a skill when naming it. Sequence 3 demonstrates mediation of meaning by modeling.

Sequence 3: Students are about to draw the letter O inside of an apple ("*omena*" in Finnish) in their exercise books. T1 draws an apple with leaves on the board and names the apple and the leaves. Next T1 models how to draw the letter O. T1 names the starting point and the direction in which to go when drawing the letter O.

1. T1: But let's start here from the leaf.
2. T1 points to the picture of an apple on the blackboard.
3. T1: *Here, and let's start from the top…*

4. T1 draws the letter O counterclockwise inside the apple.
5. T1: *To draw the circle.*
6. T1 turns to look at the children and points to the page in the book.
7. T1: *So, let's start here from the top and draw a full circle.*
8. T1: *In the middle of the white part.*
9. S1: *From here?*
10. T1: *Yes.*
11. T1: *From there.*
12. T1 models with the finger how to draw the letter O in the exercise book.
13. S: *In which direction?*
    T1.2

T1 named the place where students were to start drawing the letter O (Lines 1, 3, 7 and 8). In addition, T1 modeled with her finger where to start drawing the letter and how to draw it in the exercise book (Line 12).

Teachers expressed affect and personal attitude for meaning. The following sequence demonstrates how T1 expressed personal attitude towards the animal which the students are to discuss, and thus confirmed the value many people placed on the animal.

Sequence 4: Students are learning spatial relations. They are differentiating animals in relation to a spatial concept and coloring them in their worksheet.

1. T1: *Ok.*
2. T1: *What is the next animal?*
3. T1 points to the picture in the worksheet.
4. T1: *Quite a…*
5. T1: *Not my favorite animal.*
6. T1: *S2.*
7. S2: xxxx.
8. T1: *What?*
9. S2: *A snake.*
10. T1: *A snake.*
11. T1: *And now you should find a snake which slithers on the rocks.*
12. T1: *S4.*
13. T1: *First, second or third?*
14. S4: *Second.*
15. T1: *Second.*
16. T1: *Color the snake that slithers.*
    T1.1

T1 says that snakes are not her favorite animal (Line 5). T1 expresses personal value about the animal.

The previous ways of providing meaning were common to all teachers. Provision of meaning which was not common in all teachers' interaction was cognitive meaning. The cognitive meaning category for provision of meaning included explaining why or what for, naming a strategy for work, giving a reason or telling why, explaining how, naming a strategy, providing a generalization or offering a conclusion. In Sequence 5, T1 provided meaning with an explanation.

Sequence 5: Students have written their name and the date on a worksheet. T1 instructs students to pick up a coloring pencil for coloring. T1 gives reasons for selecting a dark coloring pencil over a light colouring pencil for the work.

1. T1: *When you're done put your pencil down.*
2. T1: *Let's wait until everyone is finished.*
3. T1: *Then you can choose one coloring pencil.*
4. T1: *But not yellow.*
5. T1: *It's so light.*
6. S: *Not yellow.*
7. T1: *Mmm.*
8. T1: *All other colors are ok.*
9. T1: *But not yellow.*
10. S: *And not white.*
11. T1: *Oh, yes.*
12. T1: *You have white?*
13. T1 puts the piece of chalk down.
14. T1: *Yes.*
15. T1: *Of course not.*
16. T1: *It will not show there then.*

T1.1

T1 gave the reason that yellow is too light for the task (Line 5). T1 explained that white would not show on the paper (Line 16). T1 provided meaning for the selection of a proper color for the task with an explanation.

In addition to providing meaning, teachers requested meaning from children with questions. Teachers enhanced their questions non-verbally with their hand, finger pointing or by showing an item which was being discussed. Sequence 6 demonstrates T5's request to name a color and how she enhanced her question non-verbally.

Sequence 6: Students are learning how to use primary colors to make secondary colors. T5 goes through the colors of the color wheel with the students.

1. T5: *Can you see the wheel over here?*
2. T5 points to the color wheel on the board.
3. S: *Yes.*
4. T5: *Yes.*
5. T5: *Could you tell me the colors.*
6. T5: *What color is this?*
7. T5 points to yellow.
8. T5: *S20?*
9. S20: *Yellow.*
10. T5: *Yellow.*
11. T5: *Okay.*
12. T5 points to blue.
13. T5: *S18?*
14. S18: *Blue*
    T5: *Alright.*
15. T5 points to red.
16. T5: S19?
17. S19: Red.
18. T5: Red.
    T5.1

T5 asked students to name a color in the wheel (Line 6). She used non-verbal pointing to enhance her request (Line 7). T5 continued using pointing to enhance her request to name the rest of the primary colors (Lines 12 and 15).

In addition to naming, students responded to teachers' questions with a yes or a no. Sequence 7 provides an example of a question by T1 which S3 answered with a yes answer.

Sequence 7: Students are dividing words into syllables and identifying letters in the syllables. T1 asks whether students can find the letter Ä in the syllable.

1. T1: *With your magic finger…*
2. T1 looks at the exercise book.
3. T1: *Can you find the same syllable in the word metsä (forest in English)*?
4. T1 picks up the book.
5. T1: *The same syllable.*
6. T1: *This end syllable.*

7. T1 points to the blackboard.
8. T1: *Sä.*
9. T1: *Put your magic finger under the syllable.*
10. T1: *Can you find the letter* Ä *there?*
11. S3: *Yes.*
12. T1: *Yes.*
13. T1: *Color it with a purple coloring pencil.*
14. T1: *Take a purple coloring pencil.*
15. T1 browses through the teacher's manual.

T1.3

T1 asked if the students could find the letter Ä (Line 10). S3 responded yes (Line 11). S3 had found the letter in the exercise book.

Requests for meaning which were not common to all teachers consisted of questions how to do something, why or what for, what do you think of a task or work, or do you agree, how do you know, what if, what could be done strategy request and where did you learn something. Sequence 8 demonstrates how T2 used a How do you know? question which is cognitively valuable.

Sequence 8: T2 instructed students to pick ten pearls of two colors from the table. T2 marked the amounts students picked on the board. T2 discusses the amounts with students and asks how they know that five and five and six and four all total ten.

1. T2: *How, how can it be, hey, that you all have five and five*
2. T2 points to the set of five circles on the board
3. T2: *And five and five.*
4. T2 points to the next sets of five circles on the board.
5. T2: *And five and five.*
6. T2 points to the next set of five circles on the board.
7. T2: *And they…*
8. T2 circles all sets.
9. T2: *Add up to ten?*
10. T2: *How…*
11. T2 points to the board with a marker.
12. T2: *Can S6 have six and four and they add up to ten?*
13. T2: *Can it be right?*
14. S8: *Yes.*
15. T2: *How can it be right?*
16. S8: *Because you can count.*
17. T2: *Yes.*

18. T2 points to the board.
19. T2: *Yes.*
20. T2: *These can be added together like this.*
21. T2: *Six.*
22. T2 points to the board with the marker.
23. T2: *Plus, four.*
24. T2 points to the board with the marker.
25. T2: *Is ten.*
26. T2 points to the board with the marker.
    T2.1

T2 asked the students how different combinations of two addends could add up to ten (Line 15). S8 answered the question (Line 16). S8 said that one can count. Counting is a strategy for finding out how many. This type of interaction demonstrates valuable cognitive education.

5.1.4 Transcendence

According to the MLE theory, orientation of the mediator to widen the interaction beyond the immediate primary and elementary goal, creates in the mediatee a propensity to enlarge his cognitive and affective repertoire of functioning. Transcendence ensures that the learning experience is not limited to a single situation but is generalized to other situations. Teachers widened the learning experiences to past experiences. Some teachers used content transcendence, which connects the content being studied to other situations where a similar content has been present. Learning was widened in content through children memorizing or recalling past experiences. Transcendence to past experiences places a specific quality demand on all learning experiences as present experiences become past experiences for transcendence in the future (cf. associative learning in neurosciences Sajaniemi & Krause, 2012). Mediation for transcendence in which rules and principles governing a problem are generalized to other contents familiar to the learner enhances cognitive development of strategies.

In Sequence 1, T2 tried to ensure S6's success with her reference to the student's previous experience.

Sequence 1: Students are playing a memory card game with their teacher. Students are to find the syllables which spell their name. It is S6's turn. T2 refers to memorizing the place of the cards to help S6 succeed in picking the right cards.

1. T2: S6, your turn.
2. T2: Do you remember?
3. T2: Okay!
4. T2: There was the 6.
5. T2: S-6.
6. T2: Good!
7. T2: S6 completed the name!
   T2.1

T2 asked if S6 remembered where the right cards were (Line 2). S6 succeeded in picking the right cards and T2 congratulated S6's success in the game (Lines 6 and 7). By enlarging the current situation to previous ones, teachers try to ensure students' success.

Transcendence in relation to a child's previous experiences also appeared in relation to a tool which had been used previously or a task which had been practiced earlier. See Sequence 2 for T3 expanding the learning situation for S9.

Sequence 2: S9 has completed the task in the exercise book. T3 gives S9 additional work. T3 refers to an earlier experience for S9 to succeed in the task and widens the current learning experience to past experiences.

1. T3: *You've found all the moons there?*
2. T3: *You can take still…*
3. T3 points with her finger.
4. T3: *…a pencil and trace this kind of horizontal lines.*
5. T3: *That has been…*
6. T3 points with her finger.
7. T3: *…practiced before.*
   T3.1

T3 mediated S9 for transcendence from the current task to a previous task (Lines 5 and 7).

Content transcendence extends students to think about similar contents in another context. In Sequence 3, T4 used content transcendence.

Sequence 3: Students are looking at a picture of a forest. T4 is asking questions about the picture.

1. T4: What is in the picture?
2. T4: We've been there on a field trip.
3. S15: Forest.
4. T4: Forest.
5. T4: It's a forest.
6. T4: Autumnal forest.
   T4.1

T4 expanded the learning situation to prompt the discussion of the picture in class (Line 2). T4 bridged the content of the current learning experience, a picture of a forest, to children's fieldtrip to a forest in the past.

Mediation for transcendence in which rules and principles governing a problem are generalized to other contents familiar to the learner enhances cognitive development on strategies. Sequence 5 demonstrates how T3 used strategy transcendence.

Sequence 5: Students are working on workbook exercises. T3 gives them instructions for the next exercise. T3 refers to the strategy used in the previous task to be implemented in the next task.

1. T3: *So here then…*
2. T3 points with her finger.
3. T3: *…in the next task where there were these faces of the monster you need to find two similar ones and mark them with an x.*
4. T3: *Always should find…*
5. T3: *It says that find two of a kind.*
6. S: *Like that. Done.*
7. T3: *They have similar expressions.*
8. T3: *Mmm.*
9. T3: *And then think about the following pictures.*
10. T3: *There are different (kinds of pictures) there too.*
11. T3: *Sometimes the cat is happy and sometimes it's sad.*
12. T3: *So, you can look for two similar (ones).*
13. T3: *From these expressions of the cat.*
14. T3 shows the book to S9.
15. T3: *Two similar expressions.*
16. T3: *In the same way think.*
17. T3: *Yes.*

18. S12: *Then I'll do the next.*
19. T3: *Then the next one.*
20. T3: *The same way.*
21. T3: *Think about which ones have similar expressions.*
22. T3: *Two similar expressions.*
23. T3 observes students' work.
    T3.1

T3 widened the current learning experience to a past one in the strategy level (Lines 16 and 20). T3 urged the students to think in the same way, using a similar strategy, in the task with the faces of the cat compared to the task with the faces of the monster. In mediation, expanding the strategy level demonstrates higher cognitive education than content transcendence.

5.1.5 Feeling of competence

Teachers' interactions which reflected mediation for a feeling of competence were verbal reactions and repetition of students' answers. Interpretation of mastery and students' competence and turning it into their awareness appeared verbally when teachers approved students' answers with words such as *yes*, *yeah, right, quite true or mmm*. Their actions also reflected acceptance non-verbally. Sequence 1 reveals how T3 used both verbal and non-verbal feeling of competence interaction with the students.

Sequence 1: T3 asks questions about a monster in a story. Students are to give a thumbs-down for a no answer and a thumbs-up for a yes answer.

1. T3: Well, was the monster mean?
2. Children thumbs-down.
3. *T3: No, it wasn't.*
4. *T3: Yes.*
5. T3 nods.
6. *T3: Exactly.*
7. *T3: Well, did it have horns?*
8. *T3: Was it a horned monster?*
9. Children thumbs-up.
10. *T3: Yes.*
11. T3 nods.
    T3.1

T3 confirmed students' answers verbally in Lines 3, 4, 6 and 10 and non-verbally in Lines 5 and 11. T3 created a feeling of competence among the students by confirming that the students' thumbs-up or -down was correct.

In addition, teachers used statements. Teachers praised a student's performance or use statements such as *good, nice, well done* or *I'm proud of you*. Teachers also provided more detailed statements with an explanation. Sequence 2 indicates how T5 used feeling of competence interaction with a statement.

Sequence 2: Students are water coloring a color wheel. T5 observes their work. T5 stops to look at S19's work.

1. T5 stands behind S19 observing S19's work.
2. T5: *Good.*
3. T5: *Well done.*
4. T5: *You're really careful about the line.*
5. T5: *Yeah.*
6. T5: *You want your work to be neat and...*
7. T5: *Well done.*
8. T5: *Mmm.*
9. T5 walks to S18.
   T5.1

T5 gave S19 positive feedback without an explanation (Lines 2 and 3). T5 praised the good hand coordination and preciseness of the work (Line 4 and 6). T5 provided a feeling of competence with an explanation to S19. As competence does not necessarily imply a feeling of competence, teachers' positive statements with an explanation may function as an empowering statement for students. Specific feedback provides students with information about what it is that is good or fine about their actions and makes it easier for them to understand their progress.

Teachers created a positive feeling in the learning situation with laughter, which seemed to boost the competence of the group. It also increased the enjoyment of working together. Sequence 3 shows how T4 laughed when a student said something funny.

Sequence 3: Students are forming letters S and A with playdough at their table. T4 is softening the playdough for a student while S13 comments on its stickiness.

1. S13: *I like the stickiness of this.*
2. S13: *It brings good luck.*
3. T4: *How do you know that it brings good luck?*
4. S13: *I think this is so much fun.*
5. T4 laughs.
6. T4: *Lovely!*
   T4.2

T4 laughed with delight (Line 5) to a comment by S13. Laughter brought a positive atmosphere into the classroom and students seemed to relax and enjoy working and being together.

Teachers used politeness to create a feeling of competence with students. Sequence 5 demonstrates how politeness was used to create a feeling of competence at the end of a lesson by T5.

Sequence 5: Students are finishing their worksheet task. They are cleaning up.

1. S18 hands a set of coloring pencils to T5.
2. T5: *Thank you.*
3. S18 takes extra coloring pencils to T5.
4. T5: *Thank you very much.*
   T5.2

S18 handed coloring pencils to T5. T5 thanked S18 for the thoughtfulness and participation in cleaning up (Lines 2 and 4). Politeness creates a positive feeling in class and provides a feeling of competence in taking care of common belongings.

5.1.6 Regulation and control of behavior

Regulation and control of student behavior took place in various ways. Teachers instructed students what to do in class. They asked students to sit down, get up, take out a book, sharpen a pencil, write, color, read, put their things away and sometimes wash their hands. Teachers were ensuring the appropriateness of students' behavior in class. In Sequence 1, T5 instructed students what to do.

Sequence 1: Students are naming colors in an Art lesson. T5 is telling students what to do and in which order.

1. T5: *Purple is a secondary color.*
2. T5 puts the label (purple) next to the purple color.
3. T5: *And then we're going to glue them in the right place.*
4. T5: *Okay.*
5. S17: *When can we do it?*
6. S20: *When can we do it?*
7. T5: *Okay.*
8. T5: *So.*
9. T5: *Wet your brush nicely.*
10. T5: *And then use the primary colors, first leaving the one section empty for the secondary color.*
11. Students begin painting.
    T5.1

T5 told the students that they are going to glue the color labels in the right place (Line 3). In Lines 9 and 10 T5 told how to wet their brush and what color to use first and what to do with the first section of the color wheel. When the teacher regulated and controlled the behavior of the students, she foresaw the appropriate behavior of students leading to success in the artwork.

Teachers indicated turns to students in answering questions. They also gave turns to students in games such as hopscotch, card games and memory games. Teachers named the student in turn, pointed to the student nonverbally with their hands or they nodded to the student. See Sequence 2 for non-verbal indication of turns.

Sequence 2: Students are playing a counting game. They are counting from one to five. The student who ends up saying five has to squat down.

1. T3 points to S11.
2. S11: *One.*
3. T3 points to S9
4. S9: *Two.*
5. T3 points to S12.
6. S12: *Three.*
7. T3 points to S11
8. S11: *Four.*
9. T3 points to S9
10. S9: *Five*

11. S9 squats down.
    T3.3

T3 pointed to the student whose turn it was in the game in Line number 1, 3, 5, 7 and 9. T3 regulated the turns of students to ensure each student a turn and success in the game.

Teachers regulated and controlled student behavior by monitoring students' work and the learning process. Teachers followed student work from their seat. They observed work from the front of the classroom or walked around the working area. Sometimes teachers stopped to look at individual work. In the videos, these moments were often quiet work time. Sequence 3 demonstrates how T4 monitored student work from her seat.

Sequence 3: Students are taking turns tracing the letter A on a model with their finger. T4 monitors the tracing.

1. T4 observes the tracing of the letter A by S16.
2. T4: *And up.*
3. T4: *That's the way.*
4. T4: *All the way down.*
5. T4: *Good!*
6. T4: *And the line.*
7. T4: *Very good!*
8. T4: *To S15.*
9. T4 passes the model to S15.
10. T4 observes the tracing of the letter A by S15.
11. T4: *From there.*
12. T4: *Good!*
13. T4: *Good!*
14. T4: *Very good!*
15. T4: *Good!*
16. T4 passes the model to S13.
17. T4 observes the tracing of the letter A by S13.
18. T4: *A.*
19. T4: *Good!*
20. T4 puts the model on the side table.
21. T4 takes the model of the letter S out.
    T4.2

T4 monitored students work while sitting at a table (Lines 1, 10 and 17). By monitoring, T4 was making sure that students succeeded in tracing the letter in the correct way and thus collected proper information in their memories.

Teachers enhanced regulation and control of behavior with a hand, a touch or a look. They touched a student's hand or shoulder. Teachers also modeled the controlled way of doing something. Sequence 4 demonstrates non-verbal enhancement of control of behavior.

Sequence 4: T3 tells students what page they are to open in their workbook. Students start turning pages. T3 writes the page number on the board.

1. T3*: We start on this page.*
2. T3 points to the picture with her finger.
3. T3: *We start from the page where you can see the cat.*
4. T3 points with her finger.
5. T3: *And the dog.*
6. T3 points with her finger.
7. T3.3

T3 used finger pointing to enhance the verbal control of student behavior (Lines 2, 4 and 6). T3 indicated the page which the students were to go to next.

Teachers called for students' attention. They asked students to look or listen. Teachers requested that the students looked at the teacher, a book, a certain picture or a page. Teachers requested students to listen to the teacher, to music or to one another. Listening and looking enabled students to collect data for information processing and to solve problems in class. Sequence 5 shows the teacher's request to listen.

Sequence 5: Students have egg cartons before them on the table. They have ten pearls in the cover of the egg carton. T2 is about to give mental math problems to the students who are to move pearls to the carton according to the numbers in the math problems.

1. T2: *Then, listen.*
2. T2: *I'm going to read you a story.*
3. T2: *And then again you move the pearls there.*
4. T2 points with her finger.
5. T2: *In the egg carton.*
6. T2: *As you hear those numbers.*
7. T2: *Listen carefully.*
8. T2 looks at the teacher's manual.

9. T2: *Here they talk about these kinds of goodies this time.*
10. T2: *Are you ready?*
11. S: *Yes.*
12. T2: *There are six raisin buns on the cookie sheet.*
13. Students move pearls to the egg carton.
    T2.2

T2 instructed students to listen and listen carefully to the numbers (Lines 1 and 7). T2 ensured success in the task by controlling the collection of data by students.

Teachers regulated and controlled students' behavior in relation to time. Teachers told students when it was time to start something, for example the lesson, an exercise, a song or a game. Teachers expressed when it was time to move on or when it was time to stop an activity. Teachers asked children to wait or pace themselves. They also requested students to wait until the whole group was finished or some individual had completed a task before moving on to the next task or exercise. Teachers urged some children to speed up and some to slow down in their tasks. This was done to increase accuracy, success, to keep the group doing the same tasks or to provide individual work time for a slow student. In Sequence 6, T2 indicates moving on to the next task.

Students in T2 class are working on a worksheet where they are to color an equal number of squares as there are syllables in the words next to the squares.

Sequence 6:

1. T2: *Ok.*
2. T2: *Then it says, "How many syllables do you hear?"*
3. S: *Si-si-lis-ko [lizard]. Four.*
4. T2: *The first word is si-si-lis-ko.*
5. S: *Four.*
   T2.1

T2 moved the group on to the next task (Line 1) and reads the instructions to the group (Line 2).

In addition, teachers provided individual instructions or help, delayed impulsivity and denied certain actions. They regulated and controlled behavior in relation to incorrect answers, to tasks, school rules and noise level. They asked students to sit properly and asked students to help. Sequence 7 gives an example of how T2 controls impulsivity in the class.

Sequence 7: Students are working on worksheet exercises. They were instructed to think how many syllables there are in a word and color the same number of circles. Students are working independently.

1. T2: *Oh, S8 went to the word muurahainen [ant] already.*
2. T2: *How many in muurahainen [ant]?*
3. T2: *How many syllables…*
4. S8: *Four.*
5. T2: *…were there?*
6. T2: *Four in that also.*
7. S5: *I am also in the ant word.*
8. T2: *Yes.*
9. S6: *Ank-ka* [duck].
10. S6: *Two.*
11. T2: *Mmm.*
12. S6: *Only two.*
13. T2: *Two.*
14. S8: *In the duck, you need to color only two.*
15. T2 observes S7's work.
16. T2: *S8, if you're that fast don't say [the answer] aloud so that all the others don't then…*
17. T2: *All the others need to have, see, a chance to think of it by themselves so they don't get a ready answer.*
18. S7: *Here.*
19. S7 shows the worksheet to T2.
20. T2: *Good.*

    T2.1

T2 controlled the impulsivity of S8 (Line 16). T2 provided an explanation of restricting the impulsivity (Line 17). T2 wanted the rest of the group to have a chance to think about the answers for themselves. Allowing time to think in class is important for cognitive education. Time provides the context for cognitive tasks.

5.1.7 Resource management

I analyzed the interaction which I could not categorize in intentionality, reciprocity, meaning, transcendence, feeling of competence or regulation and control of behavior categories due to the nature and named the interaction resource management. It contained four categories: 1. Didactic item management, 2. Content material management, 3. Management of items related to students' studying and

learning and 4. Context management. Table 22 describes the content of resource management.

Table 22. Resource management in classroom interaction

1. Didactic item management	**2. Content material management**
Using items to motivate children - a toy dog Making a point in teaching-studying-learning - showing a story figure to concretize abstract matters in storytelling - handling a leaf for students to smell, feel, see and hear	Content material for teachers - opening teacher's manual, reading it, putting it away Content material for students - distribution of worksheets for students
3. Management of items related to students' studying and learning	**4. Context management**
Sharpening a pencil Picking up an eraser Making room for a student to work Stapling or punching holes in worksheets for students to file	Moving in the classroom space Keeping track of time (immaterial) Moving furniture, closing or opening a window or door (material things)

Teachers managed resources which they used for teaching, studying and learning in the school context. It included handling items which were to motivate children, concretize abstract matters in storytelling or to make a point in learning, for example in Reading and Mathematics. The way the items were used was didactic and aimed at cognitive education by effecting motivation and increasing information processing and understanding. Items which teachers used for didactic purposes included the blackboard, board pens, markers, word notes, hopscotch squares, small toys, feathers, egg cartons, a jar of pearls, construction paper, pieces of wool yarn, a hat with items in it, a basket, story figures, blackboard chalk, self-made syllable cards, multilink cubes, a ball, or music. Sequence 1 indicates how T2 used items in a didactic way.

Sequence 1: Students take turns playing a game called Candy Thief. One student is chosen to be a candy thief. The rest of the students close their eyes. The candy thief takes a certain number of pearls from the table. When the rest of the students open their eyes, they try to guess how many pearls, "pieces of candy," have been stolen from the table.

1. T2: *I'm the last candy thief.*
2. T2 picks pearls from the table.
3. T2: *Close your eyes.*
4. S: *I bet you gobble them up.*
5. T2: *Close your eyes.*
6. T2 holds the pearls in her hand.

7. T2: *How many pieces of candy did I take?*
8. T2: *S7?*
9. S7: *Nine.*
10. T2: *How did you know…*
11. T2 opens her hand to show the number of pearls.
12. T2: *…so fast?*
13. T2: *You were fast.*
14. T2: *There was one left and you knew immediately that nine had been taken away.*
15. S6: *One and then comes nine.*
16. T2. *One and nine makes ten.*
17. T2 picks up the cubes from the table and puts them away.
    T2.2

T2 handled pearls to make a mathematical point in the game (Lines 2, 6 and 11), using the pearls in a didactic way for teaching-studying-learning counting.

Content material management included handling teachers' manuals, students' workbooks or worksheets. Teachers opened teachers' manuals, read them, put them on the table, used students' workbooks and distributed worksheets. Management of items related to students' studying and learning involved handling items such as erasers, sharpeners, pencil cases, hole punchers, binders, glue sticks, papers, crayons, boards, pens and paper towels.

Context management involved the management of preschool and school space and the furniture in it. Teachers walked around the group of students to a particular student. They sat down at a table or stood up. Teachers pulled out chairs or pushed them in. They closed the door or a window in the classroom or opened it. Teachers looked at their watch or classroom clock to keep track of time. One teacher straightened a tablecloth on the table. Sequence 2 shows how T3 prepared the classroom for learning.

Sequence 2: Students are getting ready for a preschool session. T3 asks them to sit down.

1. T3: *Go and sit down.*
2. T3: *Okay.*
3. S: *Next will be the letter S.*
4. S: *Really?*
5. T3 closes the door.
6. T3: *Okay.*
7. T3: *How about the toy cat?*

8. T3 looks at the toy which is on the table where the students are sitting.
9. T3: *Should it be somewhere else?*
10. T3: *These things are almost falling off.*
11. T3 moves a sharpener on the table.
    T3.2

T3 closed the door to the classroom (Line 5). T3 looked at a toy on the table (Line 8) and asked whether it should be moved from the table (Line 9). T3 moved a sharpener so that it did not fall off the table and interrupt the session (Line 11). Ensuring the context for learning is important. Young students who are learning to learn often have difficulties choosing the right source for stimulation in a learning session. Distractions such as a falling sharpener or a toy on the table might take the focus off the intention of the lesson. Teachers guide the studying and learning process by providing with the right context for learning.

5.2 Variation of mediation and resource management in teachers' actions and over time

Teachers' actions demonstrated unequal amounts of mediation in the five examined MLE parameters. See Table 23. Teachers' actions showed the greatest amount of provision of meaning (32.98%). There was more mediation for regulation and control of behavior (20.56%) and mediation for feeling of competence (19.48%) than request for meaning (12.88%), intentionality (0.47%), reciprocity (4.67%) and mediation for transcendence (0.45%). The amount of resource management (8.48%) exceeded the amount of intentionality, reciprocity and mediation for transcendence.

Table 23. The appearance of mediated learning experience actions and resource management actions in totals and percentages

MLE and RM	Number		%
Intentionality	77	0.0047	0.47%
Reciprocity	760	0.0467	4.67%
Meaning P	5364	0.3298	32.98%
Meaning R	2095	0.1288	12.88%
Transcendence	74	0.0045	0.45%
Feeling of competence	3169	0.1948	19.48%
Regulation and control of behavior	3344	0.2056	20.56%
Resource management	1380	0.0848	8.48%
Total	**16 263**	**0.100**	**100**

Teachers' individual time normalized mediation profiles followed similar variation except for T4, who demonstrated more meaning request than mediation for feeling of competence. See Appendix H. Provision of meaning interaction appeared the most and control of behavior or feeling of competence interaction the second most. An exception was T3, whose interaction demonstrated mostly regulation and control of behavior and feeling for competence interaction. The appearance of intentionality, reciprocity and transcendence was the lowest in all teachers' interaction. Next, I present the variation of MLE and resource management in more detail.

5.2.1 Intentionality

I identified 77 expressions of intentionality which totaled 0.47 % of teachers' interaction. Intentionality which transforms the stimuli, the mediator, and the mediatee (Feuerstein et al., 1991, p. 18) and expressions of intentionality appeared in a small number. I found the intentionality expressions multidimensional. I contrast the dimensions in Table 24. and show the number of identified dimensions in each category.

The data showed that it was the teachers who were mainly responsible for indicating the intentions of the lessons. 90% of the intentions were teacher stated. In only 7 expressions out of 77 did teachers utilize reciprocity in setting the goal for the lesson, which means that intentionality was not constructed in co-operation with students. This might be an indication of teachers taking professional responsibility for the lessons and the intentions. It also might be that they do not come to think of setting intentions for structured lessons reciprocally as no individual teacher used reciprocity systematically.

Teachers expressed their intentions mostly before the activities (93.50%), which helps students to become aware of what is expected from them. But the nature of intentionality expressions was more general (16.88%) and implicit (44.15%) than specific (38.96%). Less than half of the expressions of intentionality were specific in nature, which is interesting as it is easier for students to know what is expected from them when intentions are expressed in a specific manner. The lack of specific learning goals in preschool education might hinder the need for specific intentions. Teachers might be encouraged to focus on rehearsing and practicing skills rather than teaching specific matters. Thus, the emphasis might be on the process rather than a specific product and specific goal, but as mediation is intended to produce an alteration of the state of mind of the learner, the goal of the teacher is important for the information and learning processes of the students. The intentions in this data focused more on rehearsing and practicing skills (96.10%) than imagination (3.89%). This indicates that during structured lessons students were expected to develop practical skills more than the ability to be creative or resourceful. This

might be due to teachers considering that free play provided the possibilities for creativity rather than structured sessions.

Table 24. Multidimensional appearance of intentionality

Category of intentionality	**Dimension of intentionality**	**Dimension of intentionality**	**Dimension of intentionality**	**Total number of identified intentions**
The manner of expressing the intention	Independently stated goals	Reciprocal setting of goals	-	
Subtotal	70	7		77
	0.9090	0.0909		0.100
Percentage	90%	9.09%		100%
Level of ambiguousness of the expression	General	Implying direction of studying and learning	Specific	
Subtotal	13	34	30	77
	0.1688	0.4415	0.3896	0.100
Percentage	16.88%	44.15%	38.96%	100%
Actions requested from students	Learning intention	Make-believe intention	-	
Subtotal	74	3		77
	0.9610	0.0389		0.100
Percentage	96.10%	3.89%		100%
Timing of sharing the intention	Stated before activity	Stated after activity	Future oriented	77
Subtotal	72	1	4	77
	0.935	0.012	0.051	0.100
Percentage	93.50%	1.29%	5.19%	100%

The number of expressions of intentionality varied between teachers and months. See Table 25.

Table 25. The number of intentionality expressions in September, November and February

Teacher	Month			Total
	September	November	February	
T1	1	3	2	6
T2	3	2	5	10
T3	6	1	3	10
T4	7	7	5	19
T5	6	7	4	17
T6	2	3	10	15
Total	**25**	**23**	**29**	**77**

The number of intentions expressed and identified was the highest in February (29) and the lowest in November (23), but variation between months was small. More variation in the number of intentionality expressions between teachers appeared: T1 six expressions versus T4 nineteen expressions. The nature of different content areas, subjects and students, as well as teachers' preference of the lesson structure might affect the number of intentions teachers set for a lesson. Some content areas, subjects or some groups of students might require more intentional activities than other contents and groups of students. A teacher might want to break more challenging tasks into smaller pieces, which leads to more intentional activities compared to less demanding tasks. The developmental level of students and their ability to focus and keep to a task might influence the number of intentional activities which teachers plan for structured sessions. Some teachers might prefer fewer intentions and fewer tasks for students while others might prefer to work with several tasks, which is shown in an increased number of intentions in the lessons.

5.2.2 Reciprocity

I identified and examined teachers' communication and the actions with which teachers responded to student initiatives in 760 expressions of reciprocity. The number of teachers' reciprocal reactions during lessons totaled 4.67 % of all interaction. Reciprocity appeared in eight verbal subcategories (see Table 26).

Table 26. Appearance of verbal and non-verbal reciprocity

Verbal and non-verbal reciprocity									
Sub-category	1. Verbal reaction, comment or confirmation	2. Answering student's question	3. Asking a question related to student's story	4. Repetition of student's comment or answer	5. Rephrasing student's talk or providing a word	6. Continuing telling something about the topic the student brought up	7. Other	8. Non-verbal nodding, looking, stopping to listen	**Total**
Subtotal	446	151	73	33	17	15	15	10	**760**
	0.5868	0.1986	0.0960	0.0434	0.0223	0.0197	0,0197	0,0131	**0.100**
Percentage	58.68%	19.86%	9.60%	4.34%	2.23%	1.97%	1.97%	1.13 %	**100%**

In structured small group sessions, teachers expressed reciprocity mostly with short verbal reactions, comments or confirmations (58.68%). Short verbal reactions might have been a rapid way of letting a student know that he or she was recognized in the interaction. But it could also be an indication that continuing the lesson was considered more important than the initiatives that the student made at that time. Answering student's question (19.86%) was rarer than teachers' verbal reactions, which might indicate that students learn to focus on the tasks they are given, and they do not ask questions. It might also be that students do not have questions related to the matters being worked on and for this reason teachers do not need to answer them. Teachers utilized student-based thinking very little in the interaction during structured sessions, as asking a question in relation to a student's story, helping a student to verbalize his or her thoughts and continuing with a topic a student brought up was rare. This might be due to the intentions set for the structured sessions not being to develop students' thinking skills in reciprocal and dialogic interaction.

The amount of reciprocity varied between teachers' lessons from September to February (see Table 27).

Table 27. Teacher-specific appearance of reciprocity in September, November and February lessons

Teacher	Month			Total
	September	November	February	
T1	65	49	25	139
T2	151	36	17	204
T3	70	39	49	158
T4	11	30	3	44
T5	38	7	9	54
T6	88	13	60	161
Total	**423**	**174**	**163**	**760**

Teachers' interaction appeared most reciprocal in September (423/760) and least reciprocal in February (163/760). The amount of reciprocity also varied between teachers. The amount of reciprocity decreased from September to November in T1, T2, T3, T5 and T6 lessons, and increased in T4 lessons. The amount of reciprocity increased from November to February in T3, T5, T6 lessons, and decreased in T1, T2 and T4 lessons. Changes in reciprocity between the months of February and September are presented in Table 28.

Table 28. The change of teacher-specific reciprocity from September to February

Teacher	Month			Percentage
	September	February	Change in value from September to February	
T1	65	25	-0.6153	-61.53%
T2	151	17	-0.8874	-88.74%
T3	70	49	-0.3	-30.00 %
T4	11	3	-0.7272	-72.72%
T5	38	9	-0.7631	-76.31%
T6	88	60	-0.3181	-31.81%
Total	**423**	**163**	**-0.6146**	**-61.46%**

The percentage change of reciprocity from September to February was -61.46%. This was surprising and raised questions about the possible reasons. A greater decrease appeared in T1, T2, T4 and T5 lessons. A smaller decrease was apparent in T3 and T6 lessons. Teachers taking their time to react to children's initiatives during the lessons and respond to students' questions, talk, answers or requests for help verbally and non-verbally might vary due for many teacher-, student- or content-related factors. It might be that the pedagogical relationship with students is more emphasized at the beginning of the school year. Teachers might need opportunities for retrospection and collaboration with students more in the fall term when they are getting to know the students. Students might have learnt student skills and they might be more independent in their work by spring term compared to the fall term and the need for teachers' reciprocity in the teaching-studying-learning process might be less. The nature of work might not require teachers' reciprocal input in the spring term as much as in the fall term. Teachers might utilize more structured activities which are not reciprocal in nature. It might also be that teachers have less resources for being reciprocal in their interaction towards the end of the school year compared to the beginning of the school year. The smaller decrease in reciprocity in the T3 and T6 lessons might have something to do with the years of teaching experience. Both teachers had over 20 years of experience in teaching, which might show in a more balanced teaching interaction throughout the year. It could also be that the videotaping had less impact on the work of the more experienced teachers than on the work of the less experienced teachers. The first videotaping might have increased the amount of reciprocity. It might be that teachers' awareness of being under observation was the highest in the beginning of the study. For this reason, they might have acted with higher reciprocity and anticipated that reciprocity reflects high quality teaching.

5.2.3 Meaning

According to MLE theory, mediators bring out the worth, value and meaning of a stimulus by expressing interest, affect or enthusiasm verbally or non-verbally. Meaning generates emotional, motivational, attitudinal and value-oriented behaviors. I identified and examined meaning interaction in provision of meaning (5364 codings), and teachers' request for meaning (2095 codings), which totals 7454 codings. The amount of provision of meaning during lessons totaled 32.98% of all interaction, and the amount of request for meaning totaled 12.88% of all interaction. Providing and requesting meaning formed the largest category of interaction, 45.86% in total, which shows that almost half of teachers' interactions in structured sessions focused on meaning making, which according to MLE theory, is to motivate students. Students' motivation was based mostly on teachers' meaning making. Students' input in the motivational aspect of structured lessons was less than half of teachers' input. Thus, in structured sessions, the students' role in meaning making was small. Teachers provided meaning verbally and non-verbally. Some actions in the meaning interaction were common to all teachers while others were teacher specific. Actions which were common to all teachers in provision of meaning were naming, non-verbal provision of meaning, imitating or modeling for meaning, naming own actions and expression of affect or personal attitude (see Table 29).

Table 29. Verbal and non-verbal provision of meaning in interaction

Verbal and non-verbal provision of meaning							
Sub-category	1. Naming	2. Non-verbal provision of meaning	3. Imitating or modeling	4. Naming own actions	5. Expression of affect or personal attitude	6. Cognitive meaning	**Total**
Subtotal	3186	1287	433	208	166	84	**5364**
	0.5939	0.2399	0.0807	0.0387	0.0309	0.0156	**0.100**
Percentage	59.39%	23.99%	8.07%	3.87%	3.09%	1.56%	**100%**

Naming was used 59.39% of the time to provide meaning. Naming is important for students' concept development. Concepts are used for expressing concrete and abstract thinking. Teachers used non-verbal meaning provision, imitating and modeling, which further supported students' understanding. I found naming own actions while doing something interesting. What might be the purpose of naming one's own actions in the interaction? Is it an adult's way of making conversation during the lesson while moving from one task to another? Or is to explain to students what is going to happen next? Or does it have some other purpose in the flow of actions during the lesson? The number of expressions of teachers' personal

attitude in interaction was low. This might be due to teachers taking a professional stance in teaching so that personal views on matters are put aside. Feuerstein et al., (1991, p. 26) remind us that if parents or teachers do not have a need to mediate their own meaning it has a negative outcome and it leads to lacking emotional-affective links between them and children or students. Feuerstein & al. emphasize the importance of the search for causal as well as teleological relationships between events. All teachers did not provide cognitive meaning or use writing to provide meaning. Cognitive meaning constituted 1.56 % of meaning provision interaction and I detected it 84 times. The cognitive category for provision of meaning included explaining why or what for (27 codings), naming a strategy for work (17 codings), giving a reason or telling why (13 codings), explaining how (11 codings), naming a strategy (6), providing a generalization (5 codings) or offering a conclusion (5 codings). As only some students were exposed to interaction in which reasons for matters or thinking strategies were discussed, students were in an unequal position for cognitive development. Some teachers did not discuss the value and meaning of the reason or why something was being done. Some teachers did not name strategies for work and they did not give reasons for matters or explain how something could be done better. They did not provide generalizations or offered conclusions. Teachers' who brought up thinking strategies in the interaction with the students used interaction for strategic thinking very little. The meaning interaction was not commonly and actively used for intentional cognitive education. The reasons for the lack of reasoning matters and thinking strategies can be many. It might be that teachers, who are not trained for mediation, do not come to think about the value of thinking development in meaning interaction.

Provision of meaning varied between teachers and months (see Table 30).

Table 30. Teacher-specific appearance of provision of meaning in September, November and February lessons

Teacher	Month			Total
	September	November	February	
T1	139	253	301	693
T2	465	373	276	1114
T3	196	93	384	673
T4	456	357	147	960
T5	157	427	263	847
T6	191	501	385	1077
Total	**1604**	**2004**	**1756**	**5364**

Teachers' interactions demonstrated most provision of meaning in November (2004 codings), and the least in September (1604 codings). Teacher-specific variations did not follow the overall results. Teacher 1 and Teacher 3 provided most

meaning in their February lessons, Teacher 2 and Teacher 4 in their September lessons and Teacher 5 and Teacher 6 in their November lessons. I detected three patterns in the variation of provision of meaning in the months of September, November and February: 1. Provision of meaning increased from September to February in T1 and T3 lessons, 2. Provision of meaning decreased from September to February in T2 and T4 lessons, 3. Provision of meaning peaked in T5 and T6 lessons in November. The variation might have been due to the nature of tasks teachers used in the lesson or their decisions on how to use the school year for teaching-studying-learning. T2 and T4 had the least teaching experience. It might be that teachers with less experience are still accumulating pedagogical content knowledge on how to balance a full school year for teaching-studying-learning which might show in decreasing meaning interaction during the school year.

Teachers' requests for meaning contained similar dimensions as provision of meaning in interaction. Requests to name and non-verbal requests for meaning appeared most (see Table 31).

Table 31. Verbal and non-verbal request for meaning in interaction

Verbal and non-verbal request for meaning					
Sub-category	1. Request to name	2. Non-verbal requests for meaning	3. Requests answered "Yes" or "No"	4. How, how to, what for, what if	**Total**
Subtotal	1306	399	330	60	**2095**
	0.6233	0.1904	0.1575	0.0286	**0.100**
Percentage	62.33%	19.04%	15.75%	2.86%	**100%**

The majority, 62.33% of the requests for meaning, were questions which students responded by naming. Labeling items enhances concept development. Teachers used non-verbal actions such as hand movements, finger pointing or showing an item which was being discussed when they requested meaning from students. Non-verbal requests formed 19.04% of request for meaning in interaction. 15.5% of the questions asked by teachers were responded to with a yes or a no answer by students. The nature of questions confirmed the focus on meaning making being concept development and not reasoning for why or what for, as requests for meaning which were common to all teachers formed the Request to name, Non-verbal enhancement of request to name and Requests answered "Yes" or "No" categories. Category How, how to, what for, what if, representing 2.86% of the total, included requests for meaning which were not common to all teachers. The category consisted of questions which required students to explain how to do something (19 codings), why or what for (13 codings), what do you think of a task or work, or do you agree (12 codings), how do you know (9 codings), what if (4 codings), what could be done strategy request (2 codings) and where did you learn

something (1 coding). These questions required students to rationalize more than the questions in the previous categories. Category 4 questions were cognitively more valuable than questions requiring naming or yes-no responses.

The total and teacher-specific amounts of request for meaning varied during the months of September, November and February (see Table 32).

Table 32. Teacher-specific appearance of request for meaning in September, November and February lessons

Teacher	Month			Total
	September	November	February	
T1	104	158	146	408
T2	103	126	81	310
T3	159	109	209	477
T4	180	65	59	304
T5	78	81	80	239
T6	77	128	152	357
Total	**701**	**667**	**727**	**2095**

Teachers made requests for meaning the most in February (727 codings) and the least in November (667 codings). Requests for meaning increased from September to February in Teacher 1, Teacher 3, Teacher 5 and Teacher 6 lessons. The greatest increase was in Teacher 6's lessons (75 codings). Requests for meaning decreased from September to February in Teacher 2 and Teacher 4's lessons. The decrease was the greatest in Teacher 2's lessons (121 codings). The variation in requests for meaning may indicate the nature of didactic decisions teachers made and the nature of the tasks in the lesson. A structured task might decrease teachers' interaction with students and show in decreased numbers of requests for meaning as the task might be thought to include all relevant meaning and be explicit. An intention for reciprocal interaction may lead teachers to use tasks which are based on interaction and increase the number of requests for meaning. The steady use of requests for meaning by T5 might indicate that she has developed a teaching style that is comfortable for her and her students.

5.2.4 Transcendence

Going beyond the goals of the interaction is an important component of mediation. The mediation of transcendence changes the primary goal of the interaction and widens it to remote goals (Feuerstein et al., 1991, p. 24). I identified and examined 74 expressions of transcendence. The amount of transcendence in interaction totaled 0.45 % of all interaction, which is very low and alarming due to its value for cognitive development in interaction. I categorized the expressions of transcendence with

four groups: 1. Past experience transcendence, 2. Content transcendence, and 3. Strategy transcendence (see Table 33).

Table 33. Appearance of transcendence

Appearance of transcendence				
Sub-category	1. Previous experience, reference to remembering or knowing something	2. Content transcendence	3. Strategy used in previous task	**Total**
Total	**43**	**27**	**4**	**74**

All teachers utilized children's previous experiences, remembering, recalling or children's previous knowledge in their teaching. Referring to memory and previous experiences was the most common type of transcendence (43 codings). Memory and its use in information processing is central and important for thinking skills and learning to learn. It is the processes of memory which account for learning taking place. Content transcendence, which was the second most used transcendence (27 codings), did not appear in all teachers' lessons. This placed students in an unequal position in developing understanding of how contents are connected in different situations. Cognitive transcendence, that is widening a strategy, principle or way of thinking to other contents, was rare or non-existing. It appeared only four times in this data and did not occur in all teachers' interactions. To understand how strategies, rules and principles are connected and how they appear in different situations help students to develop powerful thinking and learning to learn strategies. The value of transcendence for the development of abstract thinking is primary as it creates a propensity to enlarge one's cognitive and affective functioning and enhances orientation towards knowing and understanding (Feuerstein et al., 1991, pp. 21-22). Intentional use of transcendence might be pedagogical know-how which is acquired with training, and lack of training might be the reason for the low and unsystematic appearance of transcendence in teachers' interaction.

The appearance of transcendence in teachers' interaction varied between the teachers and months (see Table 34). The overall number of transcendences in interaction decreased between September and February. Teachers T3, T4 and T6 used less transcendence in February than in September. It might be that the highest amount of transcendence in September has little to do with intentional use of it for cognitive education. It might be that teachers utilize students' life experiences more in reciprocal interaction at the beginning of the school year to get to know the students, and the need for reciprocity and coincidental appearance of transcendence diminishes during the school year. However, this hypothesis is not supported by the highest amount of transcendence in T6's lessons in November, when she demonstrated the least reciprocity. Teachers T1 and T5 used more transcendence in February than in September. Transcendence interaction in Teacher 2's lessons

showed less variation. The appearance of transcendence could also be due to implicit awareness of it by the teachers and be random in appearance.

Table 34. Teacher-specific appearance of transcendence in September, November and February lessons

Teacher	Month			Total
	September	November	February	
T1	1	3	2	6
T2	1	1	2	4
T3	9	2	3	14
T4	11	3	7	21
T5	2	2	4	8
T6	8	12	1	21
Total	**32**	**23**	**19**	**74**

5.2.5 Feeling of competence

I identified and examined 3,169 codings of interaction for feeling of competence. Feeling of competence is a strong determinant of cognitive functioning, motivation, academic and professional achievement (Feuerstein et al., 1991, p. 29). The fact that feeling of competence interaction is the third greatest dimension of interaction in this study shows the value teachers set on it. Feeling of competence interaction consisted of 19.48% of all teachers' interaction. Verbal and non-verbal actions formed six subcategories: 1. Verbal reaction or repetition of students' answers, 2. Statement, 3. Nodding, 4. Statement with explanation, 5. Laughter and 6. Other (see Table 35).

Table 35. Verbal and non-verbal interaction for feeling of competence

Verbal and non-verbal interaction for feeling of competence							
Sub-category	1. Verbal reaction or repetition of answer	2. Statement	3. Non-verbal	4. Statement with explanation	5. Laughter	6. Politeness	**Total**
Subtotal	2529	342	139	66	63	30	**3169**
	0.7980	0.1079	0.0438	0.0208	0.0198	0.0094	**0.100**
Percentage	**79.80%**	**10.79 %**	**4.38%**	**2.08%**	**1.98%**	**0.94%**	**100%**

Verbal confirmation of students' answers and repetition of them was the commonest way of creating feeling of competence. It totaled 79.80% of feeling of competence interaction and I coded it 2,529 times. In the flow of actions, a confirmation can affirm students and ensure their participation in class, but a

short verbal reaction might not provide the needed information for a feeling of competence for all students. Teachers enhanced acceptance non-verbally. Non-verbal enhancement totaled 4.38% of all feeling of competence interaction. Non-verbal enhancement further emphasized the meaning of teachers' verbal confirmations. Praising consisted of 10.79% of feeling of competence interaction. It was more related to the mediation of feeling of competence within the MLE theory compared to verbal confirmation and non-verbal enhancement. Feuerstein & al. (ibid., 29) present the paradox of competence and feeling of competence: feeling of competence is not a direct outcome of the perception of one's capacity, but it requires the intervention of a human mediator who interprets the mastery and the competence and turns it into an awareness, feeling and consciousness of one's competence. Thus, a praising statement with an explanation which appeared 66 times and totaled 2.08% of interaction could mediate feeling of competence more accurately compared to verbal confirmation and praise due to its informative content. Unfortunately, this informative mediation for feeling of competence was low in number. As competence does not necessarily imply a feeling of competence, even when it leads to high achievement the role of teachers in supporting student motivation is very apparent. Teachers laughter formed 1.98% of all interaction for feeling of competence. I identified and coded it 63 times. Even in low numbers, laughter created a positive atmosphere in the classroom and seemingly made students feel good about their work and being together. Teachers used politeness (30 codings) to create a feeling of competence with students. This category formed 0.94% of feeling of competence actions. Politeness enforced student behavior and students' being able to feel competent about their behavior, although it did not make the competence explicit. Feeling of competence is not a necessary condition for MLE but is considered a reinforcing one. It is said to emerge from inner and outer sources and contain cognitive as well as emotional aspects. Then both the informative aspect as well as the emotional aspects of a mediating feeling of competence is important. Feuerstein et al. (1991, pp. 30-34) state that in order to feel competence, one must be competent, but possessing competence does not guarantee a conviction that one possesses it. Parents and teachers, who might differ in their readiness and propensity to mediate to the child a feeling of competence, have an important role in both equipping the child with prerequisites for competence as well as interpreting the competence for children in order to help them move from familiar to unfamiliar and from basic to higher levels of complexity. Feuerstein & al. explain further that the interpretation of competence includes making the child know that he has mastered a task as children rarely have the criteria with which to judge mastering. It also makes the child understand the importance of the fact that mastering a task reveals something about his or her competence. In the interpretation process the child gains in confidence to go beyond the task and situation. As a parent and

educator, it is easy to agree with the necessity of both an outer source and an inner source for a child or student to feel competent.

The appearance of interaction for feeling of competence varied between the teachers and months (see Table 36).

Table 36. Teacher-specific appearance of actions for feeling of competence in September, November and February lessons

Teacher	Month			Total
	September	November	February	
Teacher 1	156	147	131	434
Teacher 2	211	153	126	490
Teacher 3	282	242	166	690
Teacher 4	134	96	59	289
Teacher 5	311	256	211	778
Teacher 6	135	127	226	488
Total	**1229**	**1021**	**919**	**3169**

Most actions for feeling of competence appeared in September (1,229 codings) and the least in February (919 codings). The overall number of actions for feeling of competence decreased each month. Decrease was detected in all but T6's lessons. The change in feeling of competence interaction is presented in Table 37.

Table 37. Change in appearance of actions for feeling of competence from September to February

Teacher	Month			Total
	September	November	Change in value from September to February	
Teacher 1	156	131	-0.1602	-16.02%
Teacher 2	211	126	-0.4028	-40.28%
Teacher 3	282	166	-0.4113	-41.13 %
Teacher 4	134	59	-0.5597	-55,97%
Teacher 5	311	211	-0.3215	-32.15%
Teacher 6	135	226	0.6740	+67.40%
Total	**1229**	**919**	**-0.2522**	**-25.22%**

The table shows that feeling of competence interaction was less in all but T6's lessons in February compared to September lessons. The difference of feeling of competence interaction in February compared to September was -25.22%. The decreasing amount of interaction for feeling of competence could be an indication of increased competence of students. Teachers might have felt less need for using feeling of competence with students progressing into levels where they are more

independent than before. The increase in interaction for feeling of competence in T6's lessons might be due to greater demands in the spring term compared to the fall term in first grade. T6 might have used an increased amount of feeling of competence interaction to keep up the motivation of students as they are moving from simple tasks to more complex ones.

5.2.6 Regulation and control of behavior

Regulation and control of behavior appeared as inhibition and initiation of students' behavior. I detected and coded it 3,344 times. Regulation and control of behavior interaction, which appeared both verbally and non-verbally, consisted of 20.56% of all teachers' interaction, which demonstrates the importance teachers placed on it. I coded it in 12 subcategories (see Table 38).

Table 38. The appearance of verbal and non-verbal regulation and control of behavior

Verbal and non-verbal regulation and control of behavior			
Subcategories	**Total**		**Percentage**
1. Instruction of what to do	1278	0.3821	38.21%
2. Indication of turns	481	0.1438	14.38%
3. Monitoring student work	438	0.1309	13.09%
4. Non-verbal enhancement with hand, touch, source, modeling or look	431	0.1288	12.88%
5. Call for attention (look, listen)	229	0.0684	6.84%
6. Regulation and control of behavior in relation of time (wait, start, now)	195	0.0583	5.83%
7. Regulation and control of behavior in relation of task, strategy, how to do something	119	0.0355	3.55%
8. Delay of impulsivity	66	0.0197	1.97%
9. Regulation and control of behavior in relation of incorrect answer	61	0.0182	1.82%
10. Regulation and control of behavior in relation to school rules (24), noise level (13), sitting properly (8)	45	0.0134	1.34%
11. Request to help teacher	1	0.0002	0.00%
Total	**3344**	**0.100**	**100 %**

Instructing what to do consisted most (38.21%) of regulation and control of behavior interaction in class. The fact that this is the largest category might be due to students learning to learn and relying on teacher's guidance on what to do. Instructing what to do both initiates and inhibits student behavior by giving the direction for the desired course of actions. Regulating and controlling students' actions mostly by instructing what to do might also be connected to teachers' manner of expressing the intentions and the level of ambiguousness of

the expressions. When teachers mainly set the intentions independently and the expressions are not specific it might be more difficult for students to know what to do unless they are given guidance for their studying and learning. Indicating turns consisted of 14.38 % of regulation and control of behavior interaction. It was obvious that teachers desired to provide each student an equal opportunity to participate, and at the same time restrict some other student taking too many turns or too much common time or attention. Monitoring students' work and the learning process consisted of 13.09% of regulation and control of behavior interaction. These actions stressed teachers' responsible role in controlling and accelerating the studying and learning process. Enhancing regulation and control of behavior by means of hand, touch, modeling or look consisted of 12.88% of regulation and control of behavior interaction and increased students' understanding of teachers' actions. Call for attention, to look or listen, consisted of 6.84% of regulation and control of behavior interaction. This category being quite small in amount might be due to the students in this study not having any diagnosed learning problems. The small group size might have helped students to focus, see and hear each other and the teacher better than would have been the case in a large group. Regulation and control of behavior in relation to time consisted of 5.83% of regulation and control of behavior interaction. Classroom work takes place in a context which regulates the teaching-studying-learning process. Students learn habits of working within the given time. Until students are self-regulated, teachers are the external agents guiding students and keeping track of time. Providing individual instructions or help, delaying impulsivity and denying doing, regulating and controlling behavior in relation to incorrect answer, task, school rules, noise level, sitting properly and requesting to help the teacher consisted of 2.03% or less of the regulation and control of behavior interaction. Teachers did not have much need to pay attention to these aspects of student behavior. Regulation of behavior as a function of metacognitive self-reflective modes of functioning (Feuerstein et al., 1991, p. 39) did not come up in my observations. In my data, teachers acted as the source of control and they did not show actions of handing responsibility over to students. This might be due to the age of the students, teachers considering them too young to take responsibility for their studying and learning behavior. It could also be that we do not have traditions for expecting regulation of behavior in the socialization process from students at this age.

The amount of regulation and control of behavior interaction varied between teachers and months (see Table 39).

Table 39. Teacher-specific appearance of regulation and control of behavior in September, November and February lessons

Teacher	Month			Total
	September	November	February	
Teacher 1	177	168	210	555
Teacher 2	202	250	228	680
Teacher 3	152	188	479	819
Teacher 4	169	180	116	465
Teacher 5	148	168	57	373
Teacher 6	128	187	137	452
Total	**976**	**1141**	**1227**	**3344**

Regulation and control of behavior increased from September (976 codings) to February (1,227 codings). Teachers T2, T4, T5 and T6 used most regulation and control of behavior interaction in November. Teachers T1 and T3 used most regulation and control of behavior interaction in February. The least amount of regulation and control of behavior in September appeared in Teacher 2's and Teacher 6's lessons, in November in Teacher 1's and Teacher 3's lessons and in February in Teacher 4's and Teacher 5's lessons. Increase in regulation and control of behavior might indicate that the work is more teacher controlled as the amount of reciprocity for all teachers was the lowest in February. The need for teacher control might arise from students who are unable to focus and who show low performance. Students go through growth spurts which can lead to difficulties in focusing. Low level of academic pre-skills can lead to teachers paying more attention to their teaching practices by laying down behavioral rules and applying monitoring (Pakarinen, 2011). But the use of behavioral control has been found beneficial for both boys' and girls' skill development in math in first grade (Viljaranta et al., 2015). Adults' guidance in regulation and control of behavior is also supported in the neurobiological viewpoint when a child's regulation of stress reactivity is developing (Sajaniemi, Suhonen, Nislin & Mäkelä, 2015).

5.2.7 Resource management

Teachers' interaction included actions which aimed at managing resources which were used for teaching-studying-learning in the school context. I identified and examined resource management in 1,380 codings. It covered 8.48 % of all teachers' interaction, which was more than reciprocity and transcendence, which are more directly connected to development of cognitive functions. Resource management formed four categories: 1. Didactic item management, 2. Content management, 3. Management of items related to student's studying and learning and 4. Context

management. I present the sums and percentages of the category variables in Table 40.

Table 40. The appearance of resource management interaction

Resource management interaction					
Sub-category	**1. Didactic item management**	**2. Content material management**	**3. Management of items related to students' studying and learning**	**4. Context management**	**Total**
Subtotal	567	352	236	225	**1380**
	0.4108	0.2550	0.1710	0.1630	**0.100**
Percentage	41.08%	25.50%	17.10%	16.30%	**100%**

Didactic item management formed 41.08% of resource management interaction. I examined and coded 567 didactic item management actions. Manipulation of resources during the lessons aimed mostly at mediating learning with a concrete object. Content-related material management formed 25.50% of resource management interaction. Teachers utilized teacher manuals and worksheets and workbooks in the lessons. I examined content material management with 352 codings. These two categories having covered most of the resource management shows that teachers aim at teaching the contents. Management of items related to students' studying and learning formed 17.10% of resource management with 236 codings. This finding shows how teachers guide students in learning to learn as it is part of being a student to take care of the belongings needed for studying and learning. Context management formed 16.30% of resource management with 225 codings. Teachers supported students' studying and learning by helping them manage their belongings and ensuring the proper learning environment in the premises. Resource management showed that the teaching-studying-learning process contains an indirect feature. In addition to face-to-face interaction, teachers guided learning through didactic actions; they took care of content- and context-related matters and also assisted students in their study tasks.

The amount of resource management varied between teachers and months during the year (see Table 41). The most resource management appeared in February (540 codings) and the least in September (308 codings). Teacher-specific appearance of resource management differed from its overall appearance. Teacher 1, Teacher 4 and Teacher 5 had most resource management interaction in November. Teacher 2, Teacher 3 and Teacher 6 had the most resource management interaction in February. Four teachers (T1, T2, T5 and T6) had the least amount of resource management in September, Teacher 3 in November and Teacher 4 in February. The amount of resource management might vary due to teacher-, content-, student- and context-related matters. Teachers' manuals support class teachers in teaching

different subjects and lay the foundation for general management of teaching (Atjonen et al., 2008, p. 110). Atjonen et al. found that class teachers' awareness of intentionality is strong, particularly in general educational goals, but in subject-related goals they rely on books more than subject teachers, which might also be the case with preschool teachers and partially explain the amount of content material management. But didactic item management might refer to teachers' intentions to teach for learning and explain the use of didactic items to express the idea and enhance learning. Students who learn to take care of their personal items require less attention from the teacher to guide the management of belongings.

Table 41. Teacher-specific appearance of resource management in September, November and February.

Teacher	Month			Total
	September	November	February	
Teacher 1	28	112	94	234
Teacher 2	75	132	156	363
Teacher 3	55	22	93	170
Teacher 4	59	73	44	176
Teacher 5	38	111	48	197
Teacher 6	53	82	105	240
Total	**308**	**532**	**540**	**1380**

5.3 Teachers' pedagogical thinking on cognitive education and MLE

I examined teachers' pedagogical thinking to find out the ways it reflected aspects of cognitive education, classroom interaction and mediation. Teachers' pedagogical thinking contained views which clearly supported cognitive education, whereas some aspects of cognitive education were not supported by teachers' pedagogical thinking. Some thinking appeared unsystematic in describing intellective or non-intellective dimensions of cognitive education or mediational teaching and thus provided partial support for active and systematic cognitive education. Next, I present the interview results in more detail and include empirical examples of teachers' pedagogical thinking, aspect of pedagogical thinking as a concept cluster and my reasoning for its relation to the level of support it provides for cognitive education. As I analyzed the interviews in number order starting from T1, I include examples from each teacher only if they provided a new view or insight concerning the topic of discussion. If the teacher's thinking confirmed the views provided by previous teachers and did not introduce a new dimension into the discussion, I did not include it in the empirical examples.

5.3.1 Teachers' pedagogical thinking reflecting aspects of cognitive education and classroom interaction

The views which supported cognitive education included considering the task of preschool and first grade education to teach knowledge, skills and subject content. Cognitive functions are made up of knowledge and skills and content matters are processed with cognitive functions. Preschool teachers emphasized the task of preschool to enhance students' attitudes, motives and dispositions for learning, in addition, the developmental task of preschool was brought up by one teacher. It targets the non-intellective dimension of cognitive education when preschoolers being the oldest in daycare were said to be given a special value and attention in early childhood education. The first-grade teacher emphasized the development of student identity and learning to learn skills which enhance the intellective dimension of cognitive functions. Teachers' thinking on the task of education supported both non-intellective and intellective cognitive education. Preschool teachers' consideration lacked the development of thinking skills which the first-grade teacher did consider. The non-intellective dimension of cognitive functions was not apparent in the first-grade teacher's pedagogical thinking for the task of first grade education (see Table 42).

Teachers thinking on their roles supported cognitive education in a partial manner. Preschool teachers stated that their roles were that of a teacher and an educator but also as adults and models. They also stated that they guide other staff members in education, but as teachers did not elaborate how they use the different roles for cognitive education or how they guide other staff members in cognitive education it might or might not take place. Similarly, the first-grade teacher's consideration of herself as a mother-figure supports non-intellective cognitive education but leaves the appearance of mediational teaching open which she, however, considered the task for first grade education (see Table 43).

Table 42. Empirical examples of teachers' pedagogical thinking on the task of education, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
The task of preschool education/ first grade education	***Basics for learning to read*** *at school. Should be* ***skillful to do exercises****. Learning to read is not important but the* ***social side*** *is. Knowing how to function in a group, waiting for one's turn, taking care of one's own belongings, interaction with others.* T1 Initial interview	Basic knowledge Skills to do exercises and function socially	Supports intellective aspect of cognitive education.
	Good self-esteem and learning motivation *with a feeling that I'm learning, and learning is fun. Offering a* ***special year of being the kings****, a little extra. They are the oldest who get some privileges and such.* T2 Initial interview	Self-esteem, Motivation Developmental task	Supports non-intellective aspect of cognitive education. Supports non-intellective aspect of cognitive education
	School subjects and subject specific work methods *observation, prediction, classifying, shapes. Becoming a* ***student****. Managing routines, taking care of tasks, belongings, and moving from one place to another.* ***Social skills****, respect for others and team spirit.* T6 Initial interview	School subjects Learning to learn skills. Student identity Social skills	Supports intellective cognitive education. Supports intellective cognitive education

Table 43. Empirical examples of teachers' pedagogical thinking on teacher's role, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
The role of the preschool teacher/ primary school teacher	*As a kindergarten **teacher I have the main responsibility** in the team. I make the plans and we realize them together.* T1 Initial interview	Responsible teacher	Partial support of cognitive education.
	*I am **the expert** with pedagogical knowledge. I guide other staff toward matters which are important. It can't be just anything we do with children. And even more important is how we do it. **An adult** and **a teacher**. Not a teacher-teacher in a negative sense but an **educator**.* T2 Initial interview	Expert Adult and teacher Educator	Partial support of cognitive education. Partial support of cognitive education.
	*Teacher, adult, an educator. For children, it is important that I am a teacher. They call me teacher. A **model** for children. An educator and a teacher. Cannot separate them.* T3 Initial interview	Model	Partial support of cognitive education.
	*A **mother-figure**. Caring **so they feel safe.** Sometimes one must be strict and set boundaries.* T6 Initial interview	Mother-figure	Supports non-intellective cognitive education.

Teachers thought of teaching as interaction and learning to require interaction. These views consider that cognitive education is a good foundation at school but as teachers did not elaborate how interaction is used for the development of cognitive functions, the support of these views for cognitive education is partial. Teachers said that they developed their pedagogical relationship in interaction and said that it was used for observing students' feelings, make them feel safe and important. This is cognitive education and enhances the non-intellective aspects of cognitive functions (see Table 44).

Table 44. Empirical examples of teachers' pedagogical thinking on interaction and teaching, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Interaction and teaching	***That's what it is***. *It's not the same what I babble if we don't have interaction; they aren't interested in what I do.* T1 Initial interview	Teaching is interaction.	Partial support of cognitive education.
	I think that ***learning can't take place without interaction.*** *It must be there.* T2 Initial interview	Learning requires interaction.	Partial support of cognitive education.
	You're ***interacting with them all the time***. ***You're sitting with them***. *You're* ***talking with them***. ***You're trying to find out their feelings***. T5 Initial interview	Pedagogical relationship used to observe students' feelings.	Supports non-intellective cognitive education.
	Caring *so they feel safe. Also, to be able to take every child into account so that they* ***feel important***. T6 Initial interview	Pedagogical relationship to enhance feeling of importance.	Supports non-intellective cognitive education.

Teaching in preschool was thought of as holistic, providing teachers with a wide variety of possibilities for cognitive education. Teachers did not, however, elaborate how they use holistic teaching for cognitive education so the support of these thoughts for cognitive education was partial. Similarly, the description how intention to teach changes the teacher's posture and speech supports cognitive education in a partial manner as an intention to teach might lead to cognitive education or it might focus on some other goals. An unclear concept of what teaching is, which also came up, does not support cognitive education as it lacks the goals and practices for the instructional interaction to enhance cognitive functions. Challenging students' answers which a teacher described using in teaching is cognitive education and the practice enhances the intellective aspect of cognitive functions (see Table 45).

Table 45. Empirical examples of teachers' pedagogical thinking on teaching, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
Teaching in preschool/ first grade	*I never say it's wrong. I might say like it's not quite what was sought for or* ***I ask did you notice or are you sure?*** T1 Initial interview	Challenging students' answers.	Supports intellective cognitive education.
	Difficult to think what is teaching*. What are the matters we teach when there is no specific curriculum?* T2 Initial interview	Unclear concept of teaching.	Does not support cognitive education.
	How to be with a friend. Not just learning sessions and book exercises ***Teaching is doing it all****.* T3 Initial interview	Teaching is holistic.	Partial support of cognitive education.
	If I'm thinking of some teaching session my ***posture straightens and I try to speak clearly and louder****.* T4 Initial interview	Intention to teach.	Partial support of cognitive education.

Some teachers thought that intelligence cannot be taught. Some thought that motivation for learning can be affected and thinking skills can be enhanced. An unclear concept of intelligence and teachers' possibility to influence it may lead to probabilistic use of interaction for mediation. Teachers had experienced that differences in students' intelligence require differentiation of tasks. Providing cognitive stimulus only for intelligent students or having students work at their level might lead to deterministic practices and not support the cognitive education of all students, which the MLE paradigm emphasizes (see Table 46).

Table 46. Empirical examples of teachers' pedagogical thinking on teaching and students' intelligence, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
Teaching and students' intelligence	*It shows in **stimulus and challenge we provide if the child is intelligent**. Doesn't have to sit there but we offer something else.* T1 Initial interview	Intelligence requires challenge	Does not support cognitive education.
	***Intelligence is inherited, and one cannot influence it. Skills can be practiced**.* T2 Initial interview	Intelligence cannot be influenced but thinking skills can be.	Supports intellective cognitive education.
	***You might be able to influence intelligence**. If you teach badly or don't understand [what you are doing] the child might regress.* T3 Initial interview	Good teaching might enhance intelligence. Bad teaching might regress the child.	Supports intellective cognitive education.
	***Each child should have tasks at his or her level**.* T4 Initial interview	Intelligence varies and requires differentiation.	Does not support cognitive education.

Teachers thought that teaching thinking skills was important. They had experienced that students needed encouragement in using their thinking skills in learning. Good thinking skills were said to make learning easy and learners independent. These thoughts support cognitive education as they describe practices at the action level and describe the benefits of cognitive functions for learning. Teachers explained that they can urge students to think by asking questions, giving clues and by not providing ready-made answers. They did not, however, elaborate the nature of questions which would be best for cognitive enhancement, neither did they explain how giving clues or not providing ready-made answers would enhance the cognitive functioning of students. Having students predict when learning science is cognitive education. Teachers brought up that assessment of thinking skills is difficult. They stated that they observe students to find out their needs. As teachers did not elaborate how they utilize observations for assessing cognitive functions it remains open whether the observation is used for observation of cognitive functions or not. No teacher mentioned the use of dynamic assessment for assessment of thinking skills. Observation of not all students being able to make inferences or think independently reflects teaching practice but it does not support cognitive education with equal opportunities for all learners (see Table 47).

Table 47. Empirical examples of teachers' pedagogical thinking on teaching and students' thinking skills, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
Teaching and students' thinking skills	***Important***. *You need to* ***support it***. *Children know how to think. In* ***teaching to consider that they have to think and dare to act accordingly***. *I've noticed that you* ***must support it a lot.*** T1 Initial interview	Thinking skills important. Considered in teaching. Teachers support them.	Supports intellective cognitive education.
	It's ***easy to teach*** *those who have good thinking skills. They are the ones who* ***figure out things by themselves***. *They* ***learn by themselves***. ***Thinking skills are easier to teach*** *than intelligence.* ***Strategies how to think and ponder matters*** *but not intelligence. Also, if you* ***don't give ready-made answers and urge them to think, give some clues***. T2 Initial interview	Good thinking skills make learning easy and learners independent. Teachers can teach thinking strategies by urging students to think and by giving clues.	Supports intellective cognitive education. Supports intellective cognitive education.
	Can the child think? ***Quite difficult [to know****] nowadays.* T3 Initial interview	Assessment of thinking skills difficult.	Partial support of cognitive education.
	You may wake up curiosity *with science.* ***What could happen?*** *Provide them with* ***possibilities of figuring it out***. *You can* ***guide and wake them up with questions***. *But if they* ***don't have this ability*** *it shows.* T6 Initial interview	Teachers wake up curiosity and ask students to predict. Provide possibilities for thinking by guiding and asking questions. Not all students have the ability.	Supports cognitive education. Partial support of cognitive education. Does not support cognitive education.

Teachers stated that emotions are part of students' personality and that emotions affect learning. The non-intellective aspect of cognitive education was supported by teachers' pedagogical thinking. One preschool teacher said that motivation and feelings are the most important matters in the instructional process, which emphasizes the value of enhancement of the non-intellective aspect of cognitive functions. Teachers guide and support students to discuss and control their feelings. Teachers help students to verbalize feelings and learn about them to support their

motivation. Teachers consider the conative dimension of cognitive functions by paying attention to students' motivation during the instructional process. Overall, teachers thought that students need the teacher's encouragement and guidance to control their feelings; sometimes with physically holding students. Teachers can give positive feedback and guide students to be proud of themselves. These actions are intended to make students feel safe and comfortable in learning, which is cognitive education (see Table 48).

Table 48. Empirical examples of teachers' pedagogical thinking on teaching and students' motivation, attitudes and feelings, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
Teaching and students' motivation, attitudes and feelings	*Emotions are part of **one's personality**. **Adults** have feelings **too**. **Without motivation the child doesn't learn**. The **attitude** is sometimes **"Why are we doing this?"** With your **own enthusiasm you get them enthusiastic**.* T1 Initial interview	Emotions are part of human personality. Motivation is needed for learning. Teachers can motivate students	Supports non-intellective cognitive education. Supports non-intellective cognitive education. Supports non-intellective cognitive education.
	*It's maybe **the most important matter**.* T2 Initial interview	Motivation and feelings important.	Supports non-intellective cognitive education.
	***Feelings have been discussed**. More often there are children with feelings that are all mixed up. They **need special support**.* T3 Initial interview	Teachers discuss and provide special support for feelings.	Supports non-intellective cognitive education.
	***You need to encourage them**. **"Brilliant," "ok." Make them feel I am proud of myself.** They **feel safe and they feel comfortable** looking up to us.* T5 Initial interview	Students need the teacher's encouragement. Teachers can give positive feedback and make students feel safe.	Supports non-intellective cognitive education.
	*Unbalanced emotions affect all learning**. Bad feelings in the morning swarm to school.*** T6 Initial interview	Emotions affect learning. Students are learning to control them.	Supports non-intellective cognitive education.

Teachers described several ways how they guide learning to learn. Students get guidance in finding their learning style, in finding information, and are asked to predict matters. These are actions of intellective cognitive education. Some preschool teachers reported that they enhance learning to learn by providing students with experiences, moving from concrete to abstract in tasks and by making learning visible. This develops the intellective aspect of cognitive functions and students' metacognition. In addition, a teacher said that she provides preschoolers with learning environments where students can learn learning by playing. This sounds like an ideal way for preschoolers to learn, but as the active mediational role of the teacher in this playing was not described, play might or might not enhance the cognitive functioning of students. Thus, the support given to cognitive education is partial. Consideration of students' metacognition, which is part of cognitive education, was mentioned by only two teachers. Lacking consideration of the enhancement of students' metacognition does not support cognitive education in all classes (see Table 49).

Table 49. Empirical examples of teachers' pedagogical thinking on teaching and students' learning to learn skills, aspect of pedagogical thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking.	Supports, does not support, provides partial support for cognitive education
Teaching and students' learning to learn skills	*Trying to **find comfortable ways for everyone to learn**. From **concrete to abstract**, to have the child notice how he or she learns to **find his/her own learning style**. I **ask them to verbalize** how they learnt something. **Difficult** for many.* T1 Initial interview	The teacher helps students to find their learning style and enhance students' metacognition on learning.	Supports intellective cognitive education and metacognition.
	*We guide the children **to find information and how you can think about things on your own**. And I guess it's also about **making learning visible** [with portfolios].* T2 Initial interview	Learning to learn includes information processing, independent thinking and making learning visible.	Supports intellective cognitive education and metacognition.
	Lead them. Think what might come of it**. I guess **with questions. T3 Initial interview	Teachers can guide students to predict. Learning to learn can be guided with questions	Supports intellective cognitive education. Partial support of cognitive education.
	*We **guide them**. **Corners**. Lego corner. Roleplay corner with mirror and costumes. In puppet corner they use puppets to play.* T5 Initial interview	Preschoolers are learning to learn in play corners.	Partial support of cognitive education.
	*You **can teach learning to learn** and you must teach it. There are so **many ways to learn**.* T6 Initial interview	Teachers must teach learning to learn.	Supports intellective cognitive education.

Next, I present teachers' pedagogical thinking on MLE. It contained views which clearly supported cognitive education as well as thoughts which did not reinforce cognitive education or did it in a fragmentary manner.

5.3.2 Teachers' pedagogical thinking reflecting mediation

Teachers brought up the fact that intentionality was something teachers and other adults thought about. Intentionality was said to be important. Teachers stated that they must rethink their intentions in interaction with students. Sometimes reflection about intentions took place after teaching, but this consideration lacked description of whether students were involved in the process. Intentionality was not clear to all teachers. A blurred concept of intentionality holds a chance for a probabilistic use of interaction for mediation and partially supports active cognitive

education. Considerations of intentionality were not elaborated further, except for one preschool teacher, who said she shared her intentions with the students by writing them on the board and going through them with students before starting the class. When teachers make their implicit intentions explicit, they mediate cognitive functions. No other teacher commented that their procedures made their implicit intentions explicit so their pedagogical thinking on intentionality supported cognitive education in a partial manner (see Table 50).

Table 50. Teachers' pedagogical thinking on teaching and intentionality, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and intentionality	*It [intentionality] is at the* ***back of my mind*** *and* ***as a team we discuss it****.* ***Afterwards****. What did the session achieve?* T1 Initial interview	Teachers think of intentionality. Intentionality reflected after learning sessions.	Partial support for cognitive education. Partial support for cognitive education.
	There ***has to be an intention in everything****. It's* ***all wasted if one doesn't think about the intentions and objectives*** *of instruction. You have to think "****Why*** *am I doing this?"* ***Children can take the intention in a different direction****. But as a teacher you have to pick out a new intention.* ***Flexible planning****.* T2 Initial interview	Intentionality included in education. Intentions and objectives bring meaning to instruction. Students have intentions. Teachers can include students' intentions in instruction.	Partial support for cognitive education. Partial support for cognitive education Partial support for cognitive education Partial support for cognitive education
	One wrestles with them every day ***but cannot specify them. Put them into words.*** T4 Initial interview	Intentionality difficult to specify.	Does not support cognitive education.
	My intention is to make them understand. That's why I write everything out*.* T5 Initial interview	Intentions made explicit to students.	Supports cognitive education.
	We have certain ***frames in the curriculum*** *of what one has to teach.* T6 Initial interview	Intentionality based on curriculum.	Partial support for cognitive education.

Reciprocal interaction is a cornerstone in mediation. The importance of reciprocity also became apparent in the interviews. Teachers stated that reciprocity is a skill and that it shows in mutual teaching and learning. This reciprocity is emphasized in mediation. Teachers considered students' feedback and ideas in reciprocal interaction. Reciprocity makes room for more active involvement

from students, but teachers' intentions, context and time may restrict reciprocity. Reciprocal interaction was said to enable student assessment. Despite the value teachers placed on reciprocity, they did not, however, share how reciprocity may be used to enhance students' cognitive functions or how the reciprocal interaction allows the assessment of cognitive functions, so I concluded that the support for cognitive education was partial (see Table 51).

Table 51. Teachers' pedagogical thinking on teaching and reciprocity, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and reciprocity	***Children's participation. Teaching adults. The adult can learn from the child.*** *Difficult* ***skill*** *for some.* T1 Initial interview	Mutual teaching and learning. Reciprocity is a skill.	Supports cognitive education.
	Children give ***feedback*** *all the time and you* ***have to act accordingly.*** *Hopefully I could be reciprocal and not get stuck with my own ideas but pick children's ideas and* ***further develop them. Reality determines*** *that sometimes you have to finish tasks.* ***Time limits. Sometimes one has to be nonreciprocal*** *and skip children's spontaneous ideas.* T2 Initial interview	Reciprocity is about teachers taking students' feedback into consideration. In reciprocal relationship the teacher further develops students' ideas. Reciprocity limited due to educational reality and time.	Partial support for cognitive education. Partial support for cognitive education. Partial support for cognitive education.
	It's like when children are able to ***work together*** *in pairs. Something in a small group.* ***Conversation*** *between children. That kind of fruitful situation.* ***Listening****. You have to* ***respect whether it is a child or an adult****.* T3 Initial interview	Reciprocity is an ability to work together. Reciprocity is fruitful conversation. Reciprocity is listening and respect for others.	Partial support for cognitive education. Partial support for cognitive education. Partial support for cognitive education.
	It's really ***important****. You can* ***assess the children while you're teaching****.* T5 Initial interview	Reciprocity important. Teachers can assess students in a reciprocal relationship.	Partial support for cognitive education.

Teachers reported considering meaning in planning. Teachers stated that meaning brings worth to matters that are being learnt. In addition, they said that they discuss meaning with students. Mediation for meaning motivates learning and enhances the conative aspect of learning which is a non-intellective dimension of cognitive functions. One teacher reported that students request for meaning by

asking "*Why*" which is an important notion with regard to cognitive education. How teachers respond to such a question was not elaborated. The first-grade teacher mentioned that children begin learning meaning when they learn words and a new language. The discussion lacked elaboration of how the meaning making from word level could be extended to other cognitive contents. The pedagogical thinking on mediation of meaning supported cognitive education in a partial way (see Table 52).

Table 52. Teachers' pedagogical thinking on teaching and meaning, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and meaning	*Is* ***connected to learning*** *and* ***influences it****.* ***Personal nature of meaning.*** *I haven't thought about it.* ***Comes in planning when choices are being made. Children ask.*** *"****Why am I doing this? This doesn't make sense to me****."* T1 Initial interview	Meaning influences learning. Meaning is personal in nature. Teachers think about meaning in planning and when making decisions. Students ask for meaning.	Partial support for cognitive education.
	Everything is meaningful that you teach*.* ***It has to be****.* T2 Initial interview	Teaching is based on meaning.	Partial support of cognitive education.
	I think ***meaning makes it important.*** *Not just for fun.* ***We have to show children that this has some meaning****.* ***We bring it out in discussions.*** T3 Initial interview	Meaning provides importance to the instructional process. The teacher's task is to point out the meaning of matters. Meaning is discussed with students.	Partial support of cognitive education.
	First*, we are at the* ***word level****. Facial expressions, body language.* ***Expressions can communicate many kinds of matters.*** T6 Initial interview	Meaning making begins with word-level meanings. Meaning can be communicated non-verbally.	Partial support of cognitive education.

When the concept of transcendence was discussed teachers thought of projects such as baking when learning about food ingredients or field trips to a forest after forests had been discussed in class. Projects provide students with an opportunity to learn that contents are connected, and they describe practices of cognitive education. Content transcendence, however, does not expand to principles or strategies which are cognitively valuable. No teacher discussed cognitive transcendence. One teacher stated that children's learning and world is holistic. This view holds multiple opportunities for transcendence but lacks description of how the holistic world could be used for transcendence and enhancement of cognitive functions. Teachers'

pedagogical thinking of transcendence did not reflect the cognitive possibilities presented in the MLE theory but did give partial support for systematic cognitive education (see Table 53).

Table 53. Teachers' pedagogical thinking on teaching and transcendence, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and transcendence	*We try to* ***widen the projects to bigger entireties where many things are connected****. It's a goal one* ***should aim at****. Sometimes the day just goes. Yes, it* ***comes a little bit. But not systematically****.* T1 Initial interview	Transcendence is about projects which connect matters being learnt. Teachers do not consider transcendence systematically.	Partial support of cognitive education. Partial support for cognitive education.
	With little children, everything is connected*. Their* ***world is whole****.* ***You cannot teach irrelevant*** *matters.* ***Teaching has to be connected to their world. It has to be linked to other matters than in the lesson****.* T2 Initial interview	Preschool students' world is holistic. Teaching needs to be connected to their experiences outside of the lesson.	Partial support of cognitive education. Partial support for cognitive education.

Teaching and a feeling of competence were familiar topics for teachers. It showed in a greater number of viewpoints compared to the other topics in the interviews and the more precise description of the practices. Teachers' experience was that students need strengthening in believing in themselves and that a lack of feeling of competence showed in students not trying or not wanting to learn. Bringing up the notion that the non-intellective dimensions of cognitive functions are part of successful learning provides the need for teachers to enhance a feeling of competence in interaction. Preschoolers' feeling of competence was said to include a feeling of being important, positive thoughts about oneself, self-esteem, self-image and a confident attitude toward entering first grade. Teachers said they observed students' performance to find out children's needs and ways to support a feeling of competence. It was said to be easier in small rather than big groups. A teacher brought up the fact that the timing of feedback is important because when it was timely, it can have long-lasting effects. These actions support cognitive education.

Teachers said that they guided a feeling of competence with positive feedback, praising by saying "good", showing a thumbs-up or giving a hug. These actions describe action-level cognitive education and enhancement of the non-intellective dimensions of cognitive functions. But the descriptions lacked differentiation of

the cognitive functions of students that teachers gave positive feedback on. The thinking supported cognitive education in a partial way. One teacher reported that she accepts as much of students' work as possible. This is what mediating teachers do. They accept the answers given by students, but also challenge them and require justification and explanations. Another teacher said that she has a habit of asking the students if they are satisfied with their work. Thinking about learning is cognitive education. The teacher did not, however, describe whether she asks the students to assess the process in addition to the product. In MLE the process is as valuable as the product. Some preschool teachers stated that they make children's learning visible. Visualizing a process sounds like an excellent way of increasing students' metacognition of their learning.

Teachers shared that guiding a feeling of competence is not always easy. Teachers had experienced that multicultural students expose teachers with language and cultural challenges in guiding feeling of competence. Furthermore, teachers reported that some children reject positive feedback from the teacher and that some students are too timid to accept the feedback in public. Teachers mentioned that recognition of children who do things right most of the time can be forgotten by teachers when other students require intensive attention. A teacher stated that students must be metacognitively aware of their knowledge. Mediators also enhance students' metacognition to encourage a feeling of competence (see Table 54).

Table 54. Teachers' pedagogical thinking on teaching and students' feeling of competence, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and students' feeling of competence	*A feeling of competence is* ***essential from the child's point of view****. When there are 11 children it is possible to* ***detect a child, who needs strengthening****.* ***Sometimes it's the whole group. The feeling of competence differs from child to child.*** *Some are* ***overconfident****. Some are competent but* ***timid****.* ***Positive feedback. I never say that's wrong.*** *I turn it so that yes, could be, but it wasn't what was searched here. For some, a* ***thumbs-up*** *is enough. Some need a* ***hug****.* T1 Initial interview	Feeling of competence is important for the student. Teachers observe students' needs for strengthening. Feeling of competence differs from student to student. Teachers provide a feeling of competence with positive feedback, a thumbs-up, a hug and by accepting students' answers.	Partial support of cognitive education. Partial support of cognitive education. Supports non-intellective cognitive education. Supports non-intellective cognitive education.
	You must have ***metacognitive knowledge*** *so that you know what you know and what you don't know. I* ***praise and support*** *and* ***make learning visible****.* T2 Initial interview	Feeling of competence is based on metacognitive knowledge of one's knowledge. Teachers enhance a feeling of competence with praise, support and making learning visible.	Supports cognitive education. Supports non-intellective cognitive education.
	Challenging*.* ***Multilingual*** *children.* ***To be able to tell and show.*** T3 Initial interview	Guiding a feeling of competence with multicultural students is challenging for teachers.	Partial support for non-intellective cognitive education
	A feeling of competence is about ***children knowing how. Self-esteem, self-image*** *and the idea that the child feels that he or she is* ***important.*** *When the child does something well and if I* ***say good, did you notice? just at the right moment it goes a long way****. Particularly for* ***those who always swim like fish*** *in the water. You* ***have succeeded****.* T4 Initial interview	Feeling of competence is knowing how to do something. Feeling of competence shows in self-esteem, self-image and a feeling of importance. Teachers can enhance a feeling of competence with well-timed feedback. Successful students need teachers' confirmation of their competence.	Supports non-intellective cognitive education. Supports non-intellective cognitive education Supports non-intellective cognitive education Supports non-intellective cognitive education
	The other day someone said, "I don't play that game because ***I don't want to lose"****. Because they have* ***the feeling****.* ***Then they just sit. I don't want to learn.*** T5 Initial interview	A lack of feeling of confidence shows in students' not wanting to learn.	Supports non-intellective cognitive education.
	In Art ***I ask if they are satisfied with their work****.* *If one knows that the child is sensitive* ***don't say it in front of everyone because they cannot accept it****.* T6 Initial interview	Teachers can guide a feeling of competence by asking students about their satisfaction with their work. Supporting students' feeling of competence can be challenging for teachers.	Partial support for non-intellective cognitive education. Supports non-intellective cognitive education

Teachers defined regulation and control of behavior to be about discipline and giving others an opportunity to work in peace. The ability to focus for an hour and the act of raising one's hand to answer were thought to be part of regulation and control of behavior. These definitions did not include the orientation of the individual to self-reflection, metacognition and self-initiated behavior towards learning, which the MLE theory emphasizes. Regulation and control of behavior was seen as part of education and it was considered a demanding skill for some preschool and first-grade students. These views support cognitive education in a partial manner as no direct connection between students' cognitive functions or their development and mediation was mentioned. Teachers described the multiple ways they use to regulate and control students' behavior. Teachers give positive feedback, they set rules and boundaries and let students know the consequences of inappropriate behavior. The practices describe the role of teachers in controlling students' behavior, but they lack consideration of students' self-control, which only two teachers brought up. One of these teachers reminds students about proper behavior and talks about it when student's self-control is lacking. Another said that she turns a blind eye to unregulated behavior if she detects that these students can return to a self-controlled mode. These actions described mediation of regulation and control of behavior and minding students' self-regulation.

Regulation and control of behavior was said to help students in learning. Students know what they are doing when they can control and regulate themselves. One of the teachers said that regulation and control of behavior is the starting point for information processing. That is what cognitive functions are used for. Reminding students to keep their mind open for learning is cognitive education as it reminds students what they should focus on. An opposite view on the purpose of regulation and control of behavior was brought up by a teacher who stated that regulation and control of behavior is practiced for school. This does not support cognitive education, which emphasizes students' self-initiated and autonomously controlled behavior for learning. Teachers defined uncontrolled and unregulated behavior as disturbing others and an inability to focus. Two teachers stated that unregulated and uncontrolled behavior is disturbing, stressful and annoying to teachers. Impaired cognitive functions challenge mediational interaction and the instructional process in the social context at school (see Table 55).

Table 55. Teachers' pedagogical thinking on teaching and regulation of control and behavior, empirical examples, aspect of thinking and support for cognitive education

Interview question	Empirical examples	Aspect of pedagogical thinking	Supports, does not support, provides partial support for cognitive education
Teaching and regulation and control of behavior	*It's **practiced for school**. It's one of the goals of the learning sessions to **learn to control one's behavior and not to disturb your friend**. **Allow others to work in peace. Raise your hand to speak**. **Manage to be focused at least an hour**.* T1 Initial interview	Students need regulation and control of behavior for school. Regulation and control of behavior is about giving the peace to work for others. Regulation and control of behavior is about raising one's hand and ability to focus for an hour.	Does not support cognitive education. Supports cognitive education. Supports cognitive education.
	*Fooling around can **disturb the whole thing**. Through **positive feedback**. **Rules and boundaries**. The **child knows what happens if she/he behaves in an inappropriate manner**. **Part of education.*** T2 Initial interview	Unregulated behavior is disturbing. Teachers control and regulate students' behavior with positive feedback, rules and boundaries and letting the students know the consequences of inappropriate behavior. Regulation and control of behavior is part of education.	Partial support for cognitive education. Supports cognitive education. Supports cognitive education
	In all situations**, **we talk about how to behave.** We do it if one is **incapable of controlling him/herself**. A little **reminder** about **disturbing others** and them **not being able to focus. T3 Initial interview	Teachers regulate and control students' behavior by talking about proper behavior when student's self-control is lacking. Teachers remind students about proper behavior.	Supports cognitive education. Supports cognitive education.
	***Sometimes you have to turn a blind eye**. Let it pass i**f they can continue**.* T4 Initial interview	Teachers regulate and control students' behavior by turning a blind eye if they detect that the students can return to a self-controlled mode.	Supports cognitive education.
	*[Regulation and control of behavior] **help them in their learning.** And **they don't know what they are doing** [if behavior is not controlled]. **We try to control them. Five rules**. Keep your **mind awake**.* T5 Initial interview	Regulation and control of behavior helps students in learning. Teachers regulate and control students' behavior with rules.	Supports cognitive education. Partial support for cognitive education.
	*I'm **old-fashioned with discipline**.* T6 Initial interview	Regulation and control of students' behavior is about discipline.	Partial support for cognitive education.

6 DISCUSSION

The novelty of the current study is examining mediation in a Finnish school context among teachers who are not trained to implement cognitive intervention programs but who by curriculum demand are expected to consider thinking skills and learning to learn in their teaching. This study confirms the earlier findings (Tzuriel & Remes, 2018; Greenberg et al., 1994) of non-trained teachers demonstrating mediation in their interaction. Teachers' actions in this study reflected mediation in intentionality, reciprocity, mediation for meaning, mediation for transcendence, mediation for feeling of competence and mediation for regulation and control of behavior. Thus, mediation can be part of professional classroom interaction in various teaching domains even if teachers are not trained in mediation. The results also support MLE theory, which considers the mediator's role in enhancing cognitive functions and increasing learning effectiveness (Feuerstein et al., 1991).

This study differs from research utilizing OMI (Klein et al., 1987) analysis regarding the mediation of intentionality and reciprocity. While observing when or if teachers' intentions were considered by the students, I was especially interested in *how* the teachers communicated their intentions: *how teachers made their intentions experienced, observed and perceived by the students* (Feuerstein et al., 1991). This decision enabled me to detect the multidimensionality of intentionality expressions in structured small group sessions (Table 24, Table 25): the manner of expressing intentions, their explicit or implicit nature, what actions the intentions require from the students, the timing of sharing the intention, and the number of intentionality expressions in lessons. Furthermore, as students accepted teachers' intentions in all lessons, I was able to detect that the intentions were "*reacted to by the other partner*" (Klein et al., 1987). Consequently, I shifted my focus to the ways the *teachers* demonstrated reciprocity in interaction and how they considered students' initiations. I found this important as child-initiated interactions may evoke different instructional patterns among teachers (Nurmi & Kiuru, 2015) and studying teachers' reciprocity may reveal aspects of mediation which might not be observed otherwise. This decision enabled me to increase knowledge of teachers' verbal and non-verbal reciprocity in structured small group interaction (Table 26, Table 27). The drawback of these two changes is that they limit comparisons of intentionality and reciprocity between this and other studies on mediation and mediated learning experience.

This study contributes to research examining the meaning of different curriculum objectives on teachers' planning, selection of teaching methods and work methods (see Atjonen et al., 2008) by providing a description of *how* teachers consider thinking skills and learning to learn in structured sessions. Based on

this study, teachers' actions demonstrate variation in cognitive interaction within the MLE parameters. Teachers' interactions are strong in mediation for meaning, regulation and control of behavior and mediation for feeling of competence but low in intentionality, reciprocity and mediation for transcendence, the latter being a key parameter for cognitive development (Klein et al., 1987; Lidz et al.,1990; Tzuriel, 1999). Based on the findings of this study and those by Ojala & Talts (2007), there is room for improvement in considering thinking skills and learning to learn in preschool.

The finding of teachers' actions showing the greatest amount of provision of meaning (Table 23). coincides with previous mediation research among preschool teachers (Tzuriel & Remes, 2018). Tzuriel & Remes found mediation for intentionality and reciprocity and mediation for meaning the highest in structured sessions. Based on my study, teachers' acts within each MLE parameter can be described with varying subcategory actions. For example, mediation for meaning was mostly conveyed through naming items and characters but identification of a reason, strategy, generalization or conclusion, cognitive meaning, was rare (Table 29). Similarly, requests for meaning were mostly questions which students responded to by naming or questions which were responded to with a yes or no answer. Questions of how, how to, what for, what if were rare or non-existent (Table 31). These findings indicate that inductive and deductive mediation for meaning (Haywood, 1985) was not utilized systematically and the interaction lacks strategic meaning- making.

The level of transcendence in interaction appeared low (Table 23). The low frequency of transcendence is in line with earlier findings of low mediation for transcendence among non-trained teachers and peer mediators (Tzuriel & Remes, 2018; Tzuriel & Gaspi, 2017a), and older siblings mediating their younger siblings (Tzuriel & Hanuka-Levy, 2014). All teachers in this study utilized children's previous experiences, remembering, recalling or children's previous knowledge in their teaching. Content transcendence, however, did not appear in all teachers' lessons; and cognitive transcendence, i.e. widening a strategy, principle or way of thinking to other contents, was very rare or non-existent. It seems that non-trained teachers prefer mediation of meaning in their interaction but do not utilize transcendence to increase the quality of their interaction, which is alarming when a significant relationship between the provision of transcendence and child's cognitive development has been reported.

An important contribution of this study is reporting teachers' pedagogical thinking on mediation, which has not been reported in mediation research before. The results reveal teachers' thoughts and personal views on the cognitive task of education. Teachers' pedagogical thinking contained views which clearly supported cognitive education, but some aspects of cognitive education were not supported by teachers' pedagogical thinking. Some thinking appeared unsystematic in describing

the intellective or non-intellective dimensions of cognitive education or mediation and thus provided partial support for active and systematic cognitive education. These findings coincide with the findings that teacher thinking can be limited, narrow or surface thinking (Ahonen, 2018; Ahonen et al., 2014; Mouza, 2017). Partial pedagogical thinking might explain the unsystematicity in the mediation interaction. For example, when the concept of transcendence was discussed, teachers thought of projects which widen teaching and learning such as baking when learning about nutrition or field trips to a forest after forests had been discussed in class. While projects provide students with an opportunity to learn that contents are connected, they do not necessarily turn to experiences of transcendence unless the teacher mediates the experience in that direction. As content transcendence did not appear in all teachers' lessons, all students had not been exposed to these experiences. One teacher stated that children's learning and world is holistic. This view holds multiple opportunities for transcendence but lacks description of how the holistic world could be used for transcendence and enhancement of cognitive functions. Teachers' pedagogical thinking of transcendence did not reflect the possibilities presented in MLE theory and it only gave partial support for systematic cognitive education. With training, teachers can become more aware of the principles, strategies and possibilities of mediation for MLE. This knowledge might show in their pedagogical thinking and provide room for vision and enhance practices towards more systematic cognitive interaction.

In summary, the novelty of the current study lies in describing how untrained teachers mediate cognitive functions in varying domains within the MLE theory and what they think about the cognitive task of education. The results show that mediation varies between teachers and during the school year and that some aspects of cognitive education are supported by teachers' pedagogical thinking while some are not. This study introduces new contributions to the field of pedagogy, but I do recognize the need for further research to explain the appearance and variation in both the interaction and pedagogical thinking of teachers. I discuss the limitations of the study and suggest future research topics in Chapters VII and VIII.

7 RELIABILITY AND RESEARCH ETHICS

I have tried to avoid mistakes and conduct a trustworthy study. Truth and objectivity relate not only to the ontological and epistemological questions of research but also to methodological decisions. My research interest was both practical and theoretical and the foundation for my study sprang from my teaching experience. This study was to some extent controlled as I collected the data in structured small group sessions and usually teachers work with larger heterogeneous groups of students. However, the videotaping of the instructional interaction took place during normal school hours and I asked the teachers to teach the contents in the way they would normally do with their students, so the right of students to teaching according to the curriculum was endorsed. Also, sometimes teachers work with small groups of students, a practice confirmed by the participating teachers. This study is theory-based as the research paradigm was constructed on MLE theory and previous studies which derive from cognitive psychology and sociocultural theory of learning and aim at the enhancement of cognitive functions. I examined teachers' pedagogical thinking to provide them with a voice on cognitive education. These actions are verified as quality in qualitative research by Hirsjärvi, Remes & Sajavaara (2009, p. 165) who state that "Qualitative researchers utilize comprehensive data gathering in natural situations and favor methods in which the voice of the subjects stands out."

For the research subjects to stand out, a researcher needs to show the audience the procedures she or he used to ensure that the research methods are reliable and the conclusions valid (Silverman 2013, pp. 301-302). I collected qualitative data from interactions and thus became part of the situation. In addition, I interviewed the teachers to explore the mediation phenomenon in depth. My goal was to describe and understand rather than explain. The methods have been verified in previous research. I explained my reasoning for the categories I established from the data. With these actions I have reached for truth, which Silverman calls validity. Reliability, according to Silverman, refers to the degree of consistency between different observers or by the same observer on different occasions. I used triangulation to verify the degree of consistency of my analysis. Trustworthiness in research has an ethical dimension. The relation of research and ethics is dual: on the one hand research results influence ethical solutions, and on the other hand, the ethical stance of the researcher influences his or her decisions (Tuomi & Sarajärvi 2018, p. 147). Tuomi & Sarajärvi state that if a research is not ethically durable it cannot be reliable but ethical durability does not in itself make research reliable (ibid., p. 182).

Reliability criteria can be used to reflect on the reliability issues of a study. Referring to the earlier work of Lincoln & Guba (1985), Tuomi & Sarajärvi (2018, p. 162) present four criteria for reliability: credibility, transferability, dependability and confirmability. Credibility is about the researcher's reconstructions reflecting the original constructs of the research subjects and the data reflecting the phenomenon being studied. It is about creating confidence in the truth of the findings. Confidence can be increased in activities of prolonged engagement, persistent observation, triangulation, peer debriefing, negative case analysis, referential adequacy and member checking (Lincoln & Cuba 1985, p. 301). Transferability is about generalization and transfer of the results to another context. To evaluate dependability, one needs to consider aspects which might have influenced the research, such as the context, the research and the researcher. Confirmability is reviewed by an outsider who evaluates the data, findings, interpretations and recommendations. In the following chapters I will discuss how I considered the reliability criteria which are assumed in a constructivist paradigm as relativist ontology and subjectivist epistemology according to which there are multiple realities in which the knower and respondent co-create understandings (Denzin & Lincoln 2000, p. 21). According to Denzin and Lincoln, reliability criteria replace positivist criteria of internal and external validity, reliability and objectivity.

7.1 Credibility

I tried to increase the credibility of my study by describing the research subjects and the processes of data gathering, its transcription and the analysis process. In this study the research data was videotaped using two cameras. We pretested the cameras and discussed the research needs to create a common understanding about the placement of the cameras at the research sites where one camera videotaped the actions of the teacher and the other the actions of the students. Before the lessons I asked the teachers about how they would use the classroom space. This was important for the camera crew to find the best suitable place for the cameras. Teachers wore a microphone to ensure the quality of the recording of their talk. I recorded the teacher interviews using only one recorder. Most recordings were successful. In a few instances the camera recordings did not allow identification of the student who was speaking, but the verbal and non-verbal interaction of the teachers was clearly recorded. As the lessons were videotaped three times during the school year the research subjects had a chance to get used to cameras being in the classroom. To diminish the anxiety of being videotaped and to create as natural circumstances for the interaction as possible I was not present in the classroom during the videotaping. The results of this study are based on extensive video observation and interview data which was collected during a period of six months.

Respondent validation might have increased credibility, but as the subjects were not trained in mediation for MLE I did not find respondent validation significant.

7.2 Transferability

The subject of this study was cognitive interaction in structured small groups. The interaction was authentic between a teacher and four students. It can be presumed that the interaction could be transferred to similar contexts in other classrooms. Cognitive functions provide access to the mind of the learner and guide educators to the processes of thought which influence the information processing of all of us. The results can be usable for teachers tackling the cognitive task in practice as well as for teacher educators who prepare students for the cognitive task of teaching in the future. This study verifies the use of mediation among teachers with no specific training for cognitive education and reveals aspects of mediation interaction which are covered very adequately in the interaction as well as the areas which would require more attention to count as systematic cognitive education. This study also increases our knowledge about the pedagogical thinking of teachers on cognitive education and those areas which support, do not support or partially support cognitive education. The transferability is limited, though, due to the small number of research subjects. Based on previous research, Finnish teachers are positively disposed to thinking skills and learning to learn in teaching. The mandating curriculum guides teachers to enhance the prerequisites for learning and the interviews showed that teachers experience a need to do this. Thus, when transferring the results of this study to other contexts these factors need to be considered. I have improved transferability by reporting the study as precisely as possible. I have described the theory, concepts, previous research, context and how the research was conducted. I discussed the data handling, analysis and conclusions with examples to provide a way to apply the procedures to other school contexts.

7.3 Dependability

Is my study trustworthy? Can I be certain that the findings are not dependent on the context, the research or on me as a researcher? Qualitative research requires personal skills (Shank, 2006). Skilled qualitative researchers are aware and confident of their strengths to assess situations, choose and apply techniques and change direction when needed (Shank 2006, p. 1). Shank continues by stating that skilled qualitative researchers are well versed in theory and sensitive to assumptions associated with their research processes. He emphasizes researchers' awareness of the need to learn and their ability not to lose sight of the fact that research is done

by persons who bring both commitment and enjoyment to the process. Many of these abilities have been tested during the process of this study.

I have described the methodological decisions and data analysis with care. I was able to increase my knowledge and skills to analyze mediational interaction at the Pnina Klein Center when learning to use the Observation of Mediation Interaction (OMI) instrument analysis system which Klein et al., (1987) developed to examine mediational interaction at the macrolevel between parents and their children. However, during the data gathering and analysis, I had some doubts whether I would be able to apply the instrument to a school context as such. School lessons generally have a specific structure which became apparent, for example, when examining the intentionality teachers expressed in their interaction. I found myself looking for a supplementary instrument in which the school context and structure of the lessons would be considered. I modified and applied characteristics of Klein's mother-child mediated interaction observation model and Leiwo et al.'s (1987a) classroom interaction model to catch the mediation interaction in a classroom context, which also required qualitative content analysis. This decision allowed me to detect the mediation interaction at the microlevel rather than the macrolevel and consider the interaction which consistently took place in a school context for about 30 minutes. Microlevel analysis where the analysis unit was an utterance produced a great amount of data but also revealed dimensions which I might not have been able to catch otherwise. Based on my experience on implementing cognitive intervention programs in the classroom, I presumed that enhancement of cognitive functions would be challenging. Teacher practitioners who participated in my courses on thinking skills and dynamic assessment at the University of Helsinki reported considering aspects of mediation in their interaction. This increased my desire to examine the interaction in classrooms where the teacher had no training. My presumptions of the challenges of enhancement of cognitive functions were confirmed. Systematic cognitive interaction would seem to be demanding and is not self-evident. Both the video data and interview data verified this and laid a foundation for further studies.

I used triangulation to increase the reliability of my study. I asked two preschool teachers who are familiar with the MLE theory and trained to implement cognitive interventions in the classroom to analyze ten utterances of transcribed video data. I reviewed the theory with them, and we discussed the first five MLE parameters. The rate of member check accuracy was between 85% and 90%. This increased my confidence about the reliability of the analysis. The rate of accuracy might have been higher had the teachers been familiar with the data, the OMI and Leiwo's analysis systems. Furthermore, when coding and analyzing the interview data I asked one of these teachers to verify my analysis. We discussed the interview questions, reduced empirical examples, concept clusters and I asked her to analyse ten randomly picked answers by different teachers whether they support the intellective aspect

of cognitive education, the non-intellective aspect of cognitive education, provide partial support of cognitive education or do not support cognitive education. The accuracy rate was 80%. Again, the rate might have been higher had the person been more familiar with the interview data and the analysis system, but I was satisfied with the accuracy rate and considered the analysis reliable.

7.4 Confirmability

To evaluate confirmability the researcher needs an outsider to consider the data, analysis, results and conclusions of the study. I have shown my research to interested and disinterested peers and colleagues for debriefings. Interested peers confirmed many of my judgements and provided extended insights. Encounters with disinterested peers were educational in a different way. When they rejected the research topic or questioned my decisions the continuance of the work required another kind of energy input. I have opened the research process to the reader in the previous chapters. This is important as in qualitative research, where the researcher is the main instrument, the focus in confirmability is on the status of the researcher, which the reader may evaluate. Is the researcher neutral or objective enough? Although objectivity is a chimera, a mythological creature that never existed (Lincoln & Cuba 2000, p. 181), I have nevertheless aimed at it. Lincoln & Cuba state that knowing cannot be separated from the knower, but appropriate methodology can increase confirmability. Thus, I understand that as a researcher I have influenced the research, but I have tried to take an objective stand and keep "an adequate distance between the observer and the observed" (Lincoln & Cuba 1985, pp. 299-300). I have examined cognitive education within the MLE paradigm and identified interactional practices within the first three parameters considered to be the most important and two reinforcing ones validated in previous studies. However, this analysis has omitted consideration of alternative ways to enhance the cognitive functioning of students, such as the impact of physical exercise, sleep, nutrition or music education. Furthermore, my interest in the first five MLE parameters omitted the rest of the 12 parameters which might have provided important insights into cognitive interaction. In addition, this study did not address the issue of enhancement of cognitive functions of students who have learning difficulties even though the consideration of the topic is very important as it is particularly students with learning difficulties who have been shown to benefit from cognitive interventions. The requirement of objectivity is apt to cause tension as qualitative study cannot be value free. As a researcher I valued certain questions, a certain type of a paradigm and methods over other ones and decisions I have made have had a value feature attached to them.

7.5 Research ethics

I have tried to respect the principles of responsible conduct of research according to the guidelines of the Finnish advisory board on research integrity (Varantola, 2012) and to consider research ethics from the beginning of the study. I planned and conducted the study with care. I acquired the necessary research permits and stressed that participation in the study was voluntary for both the teachers and the students. I visited each school beforehand, presented the audiovisual equipment which I used to record the lessons and interviews, and discussed the study and its goals with the subjects. I sent parents an introductory letter of the study and forms of consent, which the teachers distributed to the parents and collected from the parents whose children they had selected for the study. I stressed the confidentiality of information supplied by the teachers and students. I endorsed integrity, meticulousness and accuracy in recording and presenting the research results and archiving the data. I coded the research subjects during data analysis to respect their anonymity when analyzing and reporting the results. Only I and the videotaping group have handled the data. I stored and archived the data and Mikael Kivelä stored backup copies of the electronic data. According to my data management plans, I will destroy the electronic and non-electronic data in three years after the publication of the thesis to ensure confidentiality, except for the video DVDs. Teachers and parents gave me their consent to use the videos for educational purposes. Responsible conduct of data management is part of data handling and research ethics.

8 CONCLUSIONS

The starting point for my study was the potential of mediational interaction to enhance the cognitive functioning of learners to make independent learning more effective. The intervention programs we implemented at early primary levels with my teacher colleagues opened new perspectives for teaching. I was curious to learn how Finnish teachers in preschool and first grade enhance cognitive functions in practice and how they understand and describe the principles concerning cognitive interaction. My particular interest was to see how teachers who are not trained to implement cognitive intervention programs respond to the curriculum mandate to take the prerequisites of learning into account in their teaching. I set two tasks with two research questions for my study. The first task was to examine teaching in relation to Mediated Learning Experience (MLE). I wanted to examine 1. How teachers' actions reflect mediation and 2. How mediation varies between teachers and over time. My second research task was to investigate teachers' pedagogical thinking on cognitive education and MLE with the following two questions 1. In what ways does teachers' pedagogical thinking reflect aspects of cognitive education and classroom interaction? and 2. In what ways does teachers' pedagogical thinking reflect mediation? I utilized the MLE theory to construct the research paradigm.

Overall, this study shows that teachers develop students' cognitive functions in structured small groups in several ways, but the interaction lacks some important quality dimensions. In addition, teachers' pedagogical thinking coincides with the interaction in the respect that it supports some actions but lacks the support of others. The systemacy and quality of the cognitive interaction students are exposed to shows room for improvement. Early educators in preschool and early basic education play a significant role in preparing students with the prerequisites for learning to profit from direct learning experiences. Teacher training in which both the know-how and the development of pedagogical thinking are considered might prepare teachers for the curriculum mandate better in the future.

8.1 Further studies

This study focused on teachers' cognitive interaction in early education and first grade structured small groups. Further research could integrate free play, structured large group interaction and teachers' stimulated recall of their actions. Stimulated recall could reveal teachers' thoughts and justifications in more detail and help both researchers and practitioners to become aware of the actions and related pedagogical thinking better. Examination of mediation could extend to different

grade levels as maturation of students might affect teachers' use of cognitive interaction in teaching and reveal differences in teachers' practices. As students are exposed to valuable learning experiences outside of school it might be useful to study how cognitive education is introduced into after school programs, children's hobbies and how it is connected to academic learning at school?

This study showed that the development of students' metacognition is not systematically enhanced in interaction. Also, the amount of reciprocity varied during the school year. In addition, based on my findings, students are not involved in the meaning-making process beyond basic naming and simple questions, which require little reasoning. Furthermore, the use of transcendence appeared to be very low or non-existent. It might be useful to conduct research to find active ways to increase students' metacognition on thinking skills and learning to learn. Also, the dynamics of reciprocity in interaction might be explained by further studies. How to involve students in meaning making and how it would enhance their motivation would be worth examining. As the value of transcendence has been verified in studies on cognitive development, it would be useful to examine how to increase it in teaching.

Teachers in this study stated that the assessment of thinking skills was difficult. Research could explore the development of students' self-evaluation of cognitive functions and offer teachers trustworthy methods to assess cognitive functions in large groups. A reference base of cognitive functions and their development would be very useful for educators, parents and health care professionals who follow children's development. Possibly such a reference base could be established by means of interdisciplinary research. In this study, resource management in interaction exceeded the amounts of intentionality, reciprocity and transcendence. It would be interesting to examine if the development of teaching and learning environments would free teachers to pay more attention to aspects of cognitive education that are lacking by decreasing the need for resource management. In addition, it would be interesting to examine further the nature of didactic resource management and its relation to mediational interaction. How does manipulation of different kinds of objects in the didactic sense increase the amount and level of cognitive education and what might the cognitive benefits be for students? Teachers' pedagogical thinking revealed aspects which do not support systematic cognitive education. Possibly research could increase the pedagogical content knowledge for teaching cognitive functions by examining and developing common theoretical grounds for teachers to find justifications for their decisions regarding cognitive education. While this study focused on the actions of teachers, it would be useful to know how students perceive cognitive education and what they know about thinking skills and learning to learn and how they use these skills at different ages and contexts. As our knowledge about the brain and its functions increases, it would be useful to know what kind of material is available for students to study

the learning brain more deeply? How are the brain and its functions introduced to children and young people?

8.2 Teachers and students enhancing cognitive functions

This study has shown that cognitive interaction is a multidimensional phenomenon. For a teacher to enhance cognitive functions in classroom interaction she or he must be familiar with the elements of cognitive functions and cognitive interaction. Each MLE parameter requires elaboration and to implement the theoretical knowledge to practice, teachers need pedagogical content knowledge. In this process time and practice will help but also collegial support and knowledge are important. Cognitive functions develop from early childhood. Teachers can enhance cognitive functions, and particularly in the cases where the support at home is not optimal, teachers' role is even more important. Like in any studying and learning so too in cognitive development students' input is essential. At school enhancement of cognitive functions is a process which relies on a successful mediational interaction between students and the teacher. As part of their studying, students need to understand that enhancement of cognitive functions is part of schoolwork and learning.

Thinking skills and learning to learn are considered one of the seven transversal competencies and are integrated into the learning of content entities and school subjects. The national core curriculum supports active cognitive education. There is, however, a danger that matters such as thinking skills and learning to learn which are not given an allocated weekly lesson in the schedule might have a less important status than other contents and subjects. Matters which are evaluated and given a mark in the report card might be prioritized both by students and teachers. As research has shown cognitive functions correlate with later school success. The status of thinking skills and learning to learn as transversal competencies should not be valued any less than other contents. Teachers have stated that they take learning to learn and thinking skills into firm consideration. This study uncovered some of the actions and gave a view of what teachers think about the cognitive task of education. It would be important to guide teachers to reflect on their practices and help them see the aspects of their interaction and pedagogical thinking that clearly support the development of cognitive functions and which do not do that systematically. Also, lack of development of student metacognition, variation in reciprocity and lack of transcendence in cognitive interaction require further attention.

The pedagogical impact of the results concerns teachers but also extends to students and their parents. Teachers can use the results of this study to reflect on

their practices. Teachers can search for opportunities to increase their knowledge and skills on cognitive education and provide tasks for high level thinking for different kinds of learners to develop their cognitive functions equally at school. Teachers can have pedagogical discussions on cognitive education and include cognitive education as part of their pedagogical practice both in structured sessions and in free play. The role of the mind in learning and enhancement of cognitive functions can be introduced to parents at parents' evenings. Also, if parents were provided as precise information on the development of cognitive functions of their children as they are provided on their weight and height development, they would be able to follow the cognitive development and seek for help early, if necessary. Evaluation and assessment methods of cognitive functions are needed to benefit the child.

Effective learning is not only a matter for students, their families or teachers. It concerns all of them. Adults carry the main responsibility for providing the proper tools for children and young people to reach their potential. Learners carry their responsibility for practicing and developing their skills –including thinking skills and learning to learn – and their cognitive functions. Based on this study, good ways to enhance cognitive education in preschool and first grade are to:

- Increase teachers' awareness of cognitive functions and enhance teachers' skills to create interaction and tasks which systematically support their development.
- Increase teachers' awareness of the intellective, non-intellective and conative aspects which they take into consideration in interaction already and guide them to reach success in cognitive education in a wholistic way.
- Help students increase their metacognition on thinking skills and learning to learn and guide them to challenge their thinking.
- Point to the importance of preschool teachers' role in kindergartens and first grade teachers at school to extend the awareness, knowledge and skills among the staff and parents to consider enhancement of cognitive functions in learning.

The national core curriculum guides teachers to consider students' cognitive development. When students are exposed to cognitive education in early years, they learn to expect and think about intentionality, reciprocity and meaning in their work. When they are exposed to transcendence, they get used to thinking outside of the learning context and develop skills to see how strategies and rules apply to matters in a wide context. When students become aware of their competences and feel competent, they are more apt to strive boldly to achieve their potential.

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Appendices

Appendix A

Hyvät esiopettajat/Hyvät ensimmäisen luokan opettajat,

Olette ilmoittautuneet mukaan väitöskirjatutkimukseen, jolla kartoitetaan esiopettajan ja ensimmäisen luokan opettajan pienryhmäopetusta. Tervetuloa mukaan tutkimukselliseen yhteistyöhön!

Tutkimusaineisto tullaan keräämään tämän syksyn ja ensi talven aikana. Tutkimuksessa käytetään opetustapahtuman videointia, haastattelua ja taustatietokyselyä. Opetuksen ensimmäinen videointi tapahtuu syyskuussa ti 9.9 – ti 30.9.2008 välisenä aikana, toinen videointi marraskuussa ma 3.11 – to 20.11.2008 välisenä aikana, kolmas videointi helmikuussa ma 2.2 – pe 27.2.2009 välisen aikana.

Videoitavaan opetustapahtumaan tarvitaan teidän lisäksenne esiopetusryhmästä neljä lasta; kaksi tyttöä ja kaksi poikaa. Valituille lapsille annetaan ohessa mukana tulevat tutkimuslupa- ja taustatietolomakkeet täytettäviksi. Huoltajille tarkoitetussa kirjeessäni olen pyytänyt heitä palauttamaan täytetyt lomakkeet teille ensi maanantaihin 25.8 mennessä.

Tällä viikolla sovimme myös tapaamisesta päiväkodissanne. Toivottavasti löydämme yhteisen ajan ensi viikolle maanantai 25.8 – maanantai 1.9 välillä. Olen teihin sähköpostitse tai puhelimitse yhteydessä, jotta voimme sopia asiasta tarkemmin. Tapaamiseen osallistuvat tutkimusluvan saaneet lapset, tutkimukseen osallistuva opettaja ja tutkija. Tapaamisessa kerron tutkimuksesta, esittelen videointi- ja äänitysvälineet sekä vastaan kaikkiin mahdollisiin kysymyksiin.

Yhteistyöterveisin,

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Appendix B

Hyvät huoltajat,

Lapsenne päiväkoti/koulu ja opettaja ovat mukana tutkimusyhteistyössä ja osallistuvat kasvatustieteen väitöskirjatutkimukseen, jolla selvitetään esiopettajan ja ensimmäisen luokan opettajan pienryhmäopetusta. Tutkimusta puoltavat ja sille ovat antaneet luvan

* *

Pyydän teiltä lupaa lapsenne osallistua 30 minuuttia kestäviin opetustuokioihin, jotka videoidaan tutkimusta varten. Tutkimusvälineistönä käytetään opetustapahtuman videointia, haastattelua ja taustatietokyselyä. Opetuksen ensimmäinen videointi tapahtuu syyskuussa ti 9.9 – ti 30.9.2008 välisenä aikana, toinen videointi marraskuussa ma 3.11 – to 20.11.2008 välisenä aikana, kolmas videointi helmikuussa ma 2.2 – pe 27.2.2009 välisen aikana. Väitöskirjatyötä ohjaavat Helsingin yliopiston soveltavan kasvatustieteen laitoksen professori Mikko Ojala ja professori Juhani Hytönen.

Tutkimuksen tulokset käsitellään ja säilytetään luottamuksellisesti. Lapsien tai opettajien henkilöllisyys ei ole tutkimusraportista tunnistettavissa, eikä koulun nimeä siinä mainita.

Pyydän teitä täyttämään oheiset tutkimuslupa- ja taustatietolomakkeet ja palauttamaan ne omalle opettajalle viimeistään maanantaina 25.8.2008.

Vastaan mielelläni mahdollisiin tutkimusta koskeviin kysymyksiin.

Ystävällisesti

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Appendix C

TUTKIMUSLUPA

19.8.2008

Lapsen nimi: _____

Syntymäaika: _____

Opettajan nimi: _____

Lapsemme

_____ saa luvan

_____ ei saa lupaa

osallistua videoitaviin opetustuokioihin.

Päivämäärä _____, elokuuta 2008

Huoltajan allekirjoitus ja nimen selvennys

_____

Olkaa hyvä ja palauttakaa tämä lomake omalle opettajalle viimeistään maanantaina 25.8.2008.

Kiittäen,

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Appendix D

Tutkimukseen osallistuvan lapsen taustatiedot

1. Lapsen nimi _____
2. Lapsen syntymäaika (kuukausi ja vuosi)_____
3. Sukupuoli _____
4. Kotikieli _____
5. Huoltaja(t) _____
6. Vanhempien koulutus_____
7. Vanhempien ammatti _____
8. Sisarusten lukumäärä, ikä ja sukupuoli_____
9. Hoitomuoto ennen esiopetusta_____
10. Hoitomuoto esiopetusvuoden aikana_____
11. Lapsemme oppijana

Kuvailkaa lastanne oppijana (esim. miten lapsenne on suhtautunut uusien asioiden oppimiseen, mitkä asiat ovat olleet hänelle helppoja oppia, millaiset asiat ovat tuottaneet vaikeuksia, miten hän on toiminut, jos ei ole heti onnistunut oppimisessaan jne.)

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Tarvittaessa voi jatkaa kääntöpuolelle.

Terv. Kaarina Winter, puh. 050-4150170, 191 29840, kaarina.winter@helsinki.fi

Appendix E

Tutkimukseen osallistuvan lapsen taustatiedot

1. Lapsen nimi _____
2. Lapsen syntymäaika (kuukausi ja vuosi)_____
3. Sukupuoli _____
4. Kotikieli _____
5. Huoltaja(t) _____
6. Vanhempien koulutus_____
7. Vanhempien ammatti _____
8. Sisarusten lukumäärä, ikä ja sukupuoli_____
9. Hoitomuoto ennen esiopetusta_____
10. Hoitomuoto esiopetusvuoden aikana_____
11. Osallistuuko lapsenne aamu- tai iltapäivähoitoon ensimmäisen kouluvuoden aikana?
    Ei osallistu _____
    Kyllä osallistuu _____, hoitomuoto _____
12. Lapsemme oppijana

Kuvailkaa lastanne oppijana (esim. miten lapsenne on suhtautunut uusien asioiden oppimiseen, mitkä asiat ovat olleet hänelle helppoja oppia, millaiset asiat ovat tuottaneet vaikeuksia, miten hän on toiminut, jos ei ole heti onnistunut oppimissessaan jne.)

_____

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Tarvittaessa voi jatkaa kääntöpuolelle.

Terv. Kaarina Winter, puh. 050-4150170, 191 29840, kaarina.winter@helsinki.fi

Appendix F

Teacher interview

What are your thoughts on the following topics?
Please tell me about...

1. Your teaching experience and teaching background.
2. The lesson which was just videotaped.
3. The task of preschool education/first grade education.
4. The role of the preschool teacher/primary school teacher.
5. Interaction and teaching.
6. Teaching in preschool/first grade.
7. Your thoughts on the following concepts in relation to teaching
   - the intelligence of the child/student
   - the thinking skills of the child/student
   - childrens'/students' motivation, attitudes, feelings
   - childrens'/students' learning to learn skills
   - intentionality
   - reciprocity
   - trancendence
   - meaning
   - feeling of competence
   - regulation, control of behavior

8. Choosing children/students for the videotaping
9. How common is it for the children/students to work in a group of four?
10. How common is it for the children/students to work for a period which lasts for 30 minutes?
11. Other comments...

Appendix G

Taustatietokysely väitöskirjatutkimusta varten 05/2009

A. OPETTAJAN TAUSTATIEDOT

1. Nimi _____

2. Ikä _____

3. Ammatillinen koulutus opettajan tehtäviin. Ympyröi KAIKKI koulutuksesi.

1. lastentarhanopettaja (seminaarista, opistosta, ULO-koulutuksesta)
2. kasvatustieteen kandidaatti
3. kasvatustieteen maisteri (varhaiskasvatus)
4. erityislastentarhanopettaja
5. sosiaalikasvattaja
6. sosionomi
7. luokanopettaja/KM
8. jokin muu, mikä?_____

4. Tehtävänimike nykyisessä työpaikassa

1. lastentarhanopettaja
2. päiväkodin johtaja
3. erityislastentarhanopettaja
4. luokanopettaja
5. Muu, mikä? _____

5. Työsuhde nykyisessä työpaikassa

1. toistaiseksi voimassa oleva
2. määräaikainen

6. Tässä päiväkodissa/koulussa olen työskennellyt

1. alle vuoden
2. 1-5 vuotta
3. 6-10 vuotta
4. 11-15 vuotta
5. 16-20 vuotta
6. yli 20 vuotta

7. Työkokemukseni päiväkodissa/koulussa on

1. alle vuoden
2. 1-5 vuotta
3. 6-10 vuotta
4. 11-15 vuotta
5. 16-20 vuotta
6. yli 20 vuotta

8. Monessako päiväkodissa/koulussa olet työskennellyt tähän mennessä?_____

B. KOULU

1. Koulun nimi _____

2. Koulussa on _____**oppilasta**

3. Koulussa on _____**ensimmäistä luokkaa**

4. Koulussa on _____**ensimmäisellä luokalla olevaa oppilasta**

5. Koulun luokat, joissa on ensimmäisellä luokalla olevia oppilaita:

Luokkatunnukset ja oppilasmäärät

_____

6. Koulussa on _____ **lastentarhanopettajaa ja** _____**luokanopettajaa ensimmäisen luokan opettajina.**

7. Oman luokkani oppilaat ovat _____**-**_____ **vuotiaita**

8. Luokallani on _____**erityista tukea tarvitsevaa oppilasta.**

9. Luokallani on _____**maahanmuuttajataustaista lasta.**

10. Luokkani on

1. tavallinen ensimmäisen vuosikurssin luokka
2. erityisluokka
3. jokin muu, mikä?_____

10. Luokkani kasvatusvastuullisten työntekijöiden kokoonpano:

1. lastentarhanopettaja
2. luokanopettaja
3. luokanopettaja ja koulunkäyntiavustaja
4. muu kokoonpano, mikä?_____

11. Toimiiko alueellanne esi- ja alkuopetuksen yhteistoimintaryhmä tms?

kyllä 1
ei 2

12. Onko alueellanne tehty päiväkodin ja koulun yhteistoimintasuunnitelma?

kyllä 1
ei 2

C. KOULUTUS JA OSAAMINEN

ESI- JA ALKUOPETUKSEN KOULUTUS

1. Olen Ensio-verkon tukipari	kyllä	1	ei	2
2. Olen suorittanut alkuopetuksen erikoistumisopinnot/15 ov opintokokonaisuuden		1		2
3. Olen suorittanut esi- ja alkuopetuksen 15 ov opintokokonaisuuden		1		2
4. Olen suorittanut esi- ja alkuopetuksen 25 opintopisteen opintokokonaisuuden		1		2
5. Olen suorittanut esi- ja alkuopetuksen 35 ov (15+20) opintokokonaisuuden		1		2
6. Olen suorittanut esi- ja alkuopetuksen 35 opintopisteen aineopinnot		1		2
7. Olen suorittanut esi- ja alkuopetuksen kehittämisohjelman		1		2
8. Olen suorittanut esi- ja alkuopetuksen johtamiskoulutuksen		1		2

9. Muu esi- ja alkuopetuksen koulutus, mikä? _____

MUU KOULUTUS

9. Mitä interventio-ohjelmia käytät tai sovellat opetustyössäsi? Millaisen koulutuksen olet saanut kyseisten ohjelmien käyttämiseen?

_____

_____

_____

_____

_____

10. Mitä muita koulutuksia tai kursseja olet suorittanut, joiden antia sovellat opetustyössäsi?

_____

_____

_____

_____

_____

Voit tarvittaessa jatkaa paperin kääntöpuolelle.

D. KÄYTÄNNÖN TYÖ OPETTAJANA

1. Millainen on henkilökohtainen kasvatus- ja opetusnäkemyksesi? Voit luonnehtia sitä esimerkiksi kertomalla, mihin pyrit työssäsi opettajana, mikä opetuksessasi on keskeistä tai tärkeää, mikä on opetuksesi perusta tai mikä ohjaa opetustasi.

2. Opetuksen toteuttamisessa opettajaa velvoittaa kaupungin ja koulun opetussuunnitelma. Opetussuunnitelman toteuttaminen on kuitenkin aina henkilökohtainen tapahtuma, jossa vaikuttavat opettajan pedagogiset arvostukset, kokemukset ja vahvuudet.

Luonnehdi mitkä opetuksen tavoitteet (yleistavoitteet ja sisältötavoitteet) painottuvat työssäsi ja miksi?

Voit tarvittaessa jatkaa paperin kääntöpuolelle.

E. TUTKIMUKSEEN OSALLISTUMINEN

1. Millainen kokemus sinulle jäi tutkimukseen osallistumisesta. Mikä sujui hyvin ja mihin jäi mielestäsi parantamisen varaa?

2. Yhteydenpito jatkossa

kyllä ei

Haluan saada väliaikatietoja väitöskirjatyön etenemistä ja tutkimustulosten valmistumisesta

3. Muita viestejä tutkijalle

Voit tarvittaessa jatkaa paperin kääntöpuolelle.

SYDÄMELLINEN KIITOS VAIVANNÄÖSTÄSI!

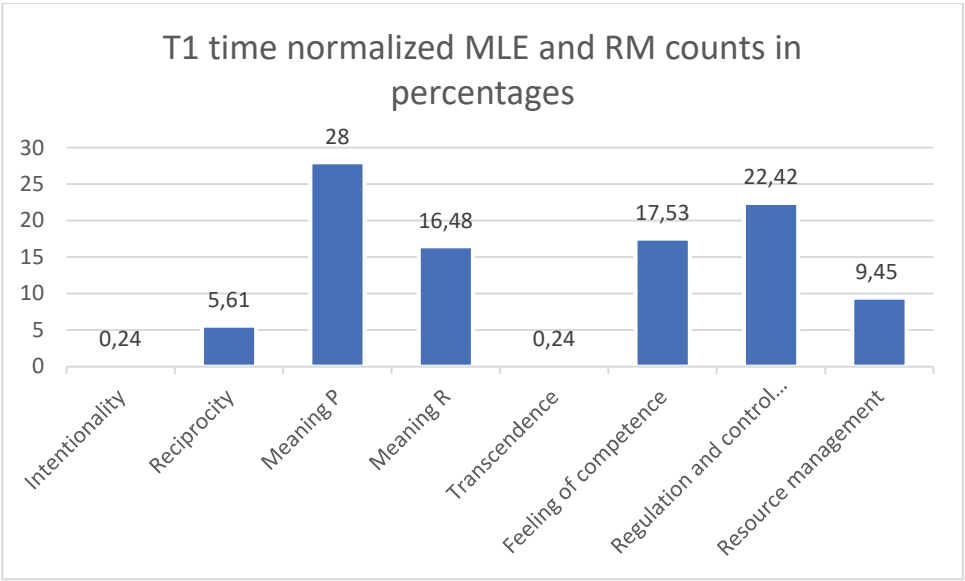
Appendix H

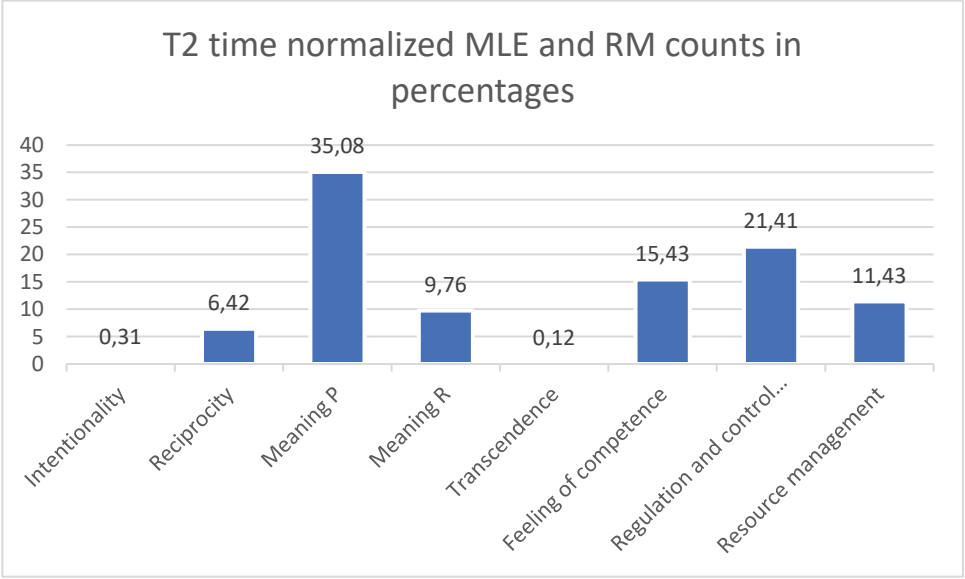
Rounded time normalized (to 30-minute lessons) MLE interaction and resource management counts.

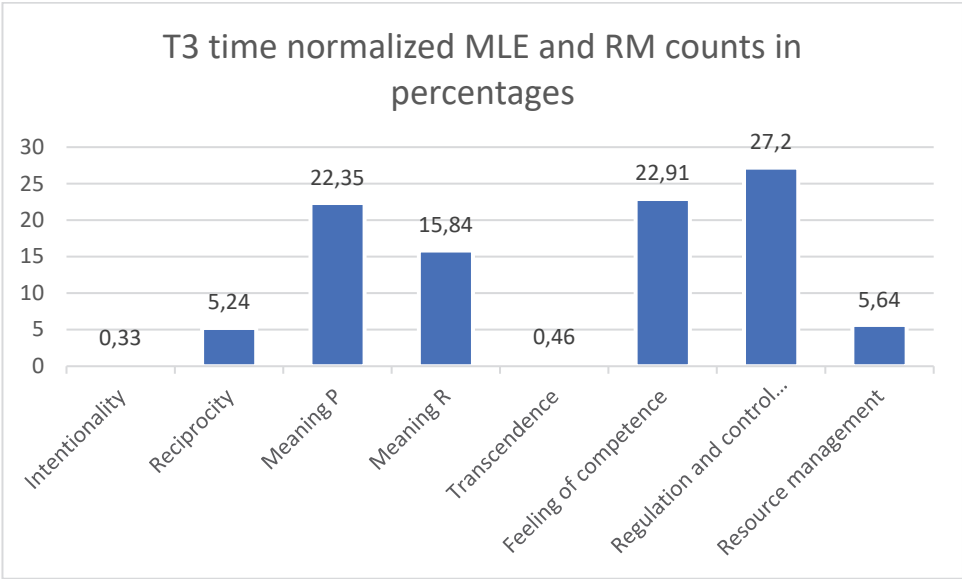
	T1	T2	T3	T4	T5	T6	**Total**
Intentionality	6	9	7	17	13	12	64
Reciprocity	135	182	117	38	43	133	648
Meaning P	671	993	496	839	669	889	4557
Meaning R	395	276	352	266	189	295	1773
Transcendence	6	4	10	18	6	17	61
Feeling of competence	420	437	509	253	614	403	2636
Regulation and control of behavior	537	606	604	406	294	373	2820
Resource management	226	323	125	154	156	198	1182
TOTALS	**2396**	**2830**	**2220**	**1991**	**1984**	**2320**	**13741**

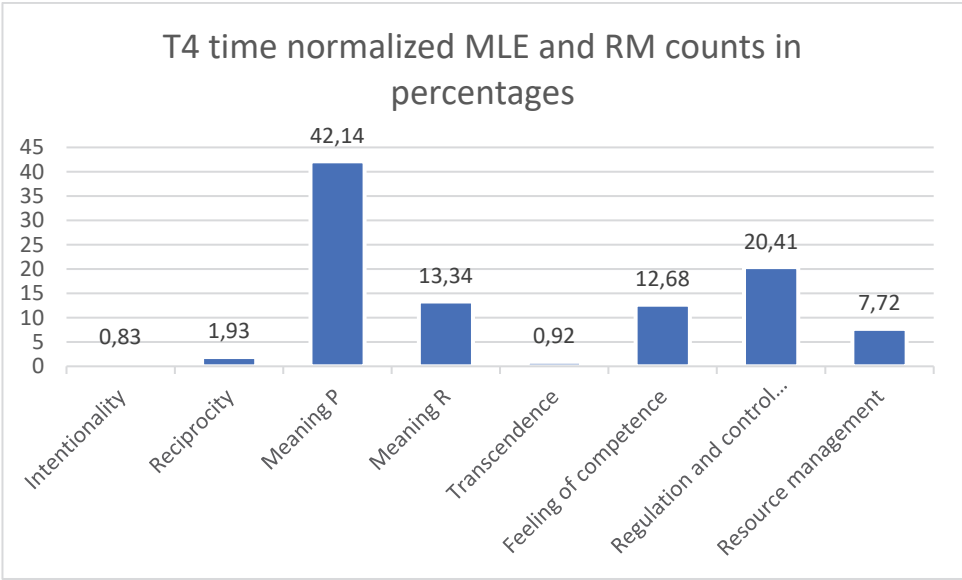
Time normalized (to 30-minute lessons) MLE interaction and resource management percentages. Rounded to two decimals.

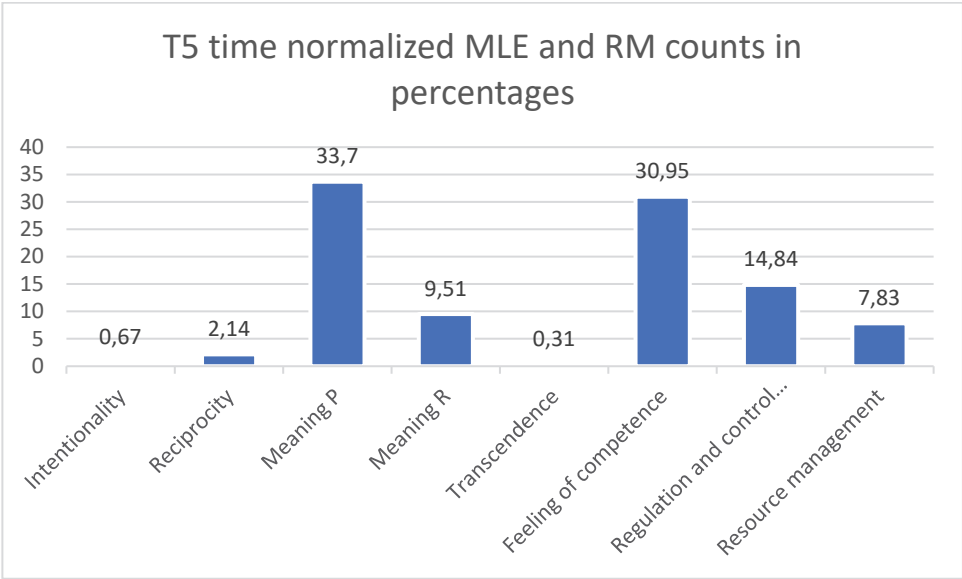
	T1	**T2**	**T3**	**T4**	**T5**	**T6**	**MEAN**	**SD**
Intentionality	0.24	0.31	0.33	0.83	0.67	0.53	0.48	0.23
Reciprocity	5.61	6.42	5.24	1.93	2.14	5.72	4.51	1.95
Meaning P	28	35.08	22.35	42.14	33.7	38.31	33.26	7.13
Meaning R	16.48	9.76	15.84	13.34	9.51	12.7	12.94	2.93
Transcendence	0.24	0.12	0.46	0.92	0.31	0.74	0.47	0.3
Feeling of competence	17.53	15.43	22.91	12.68	30.95	17.36	19.48	6.54
Regulation and control of behavior	22.42	21.41	27.2	20.41	14.84	16.07	20.39	4.49
Resource management	9.45	11.43	5.64	7.72	7.83	8.53	8.43	1.93
TOTALS	100	100	100	100	100	100		

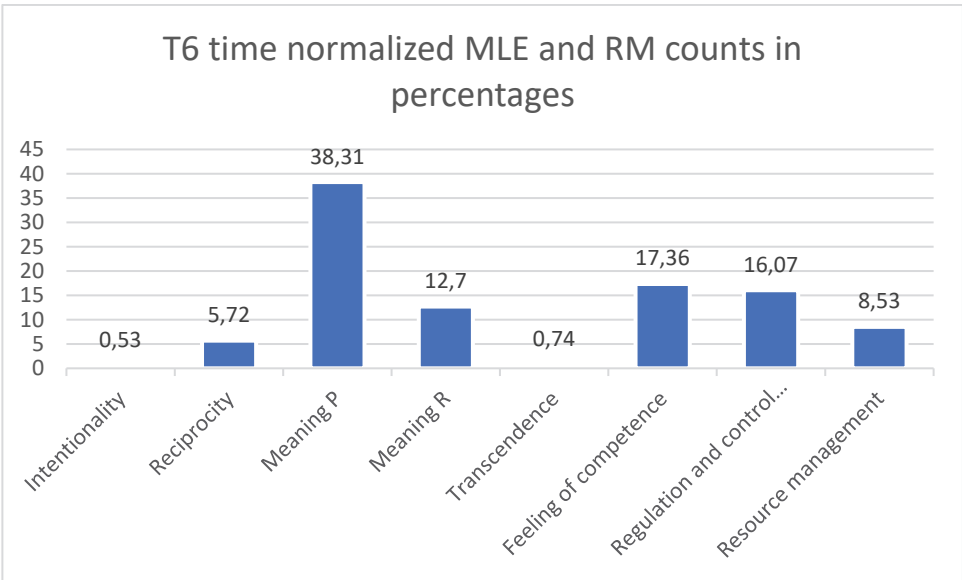

T1 time normalized MLE and RM counts in percentages
30
25
20
15
10
5
0
0,24
5,61
28
16,48
0,24
17,53
22,42
9,45
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management


T2 time normalized MLE and RM counts in percentages
40
35
30
25
20
15
10
5
0
0,31
6,42
35,08
9,76
0,12
15,43
21,41
11,43
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management


T3 time normalized MLE and RM counts in percentages
30
25
20
15
10
5
0
0,33
5,24
22,35
15,84
0,46
22,91
27,2
5,64
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management


T4 time normalized MLE and RM counts in percentages
45
40
35
30
25
20
15
10
5
0
0,83
1,93
42,14
13,34
0,92
12,68
20,41
7,72
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management


T5 time normalized MLE and RM counts in percentages
40
35
30
25
20
15
10
5
0
0,67
2,14
33,7
9,51
0,31
30,95
14,84
7,83
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management


T6 time normalized MLE and RM counts in percentages
45
40
35
30
25
20
15
10
5
0
0,53
5,72
38,31
12,7
0,74
17,36
16,07
8,53
Intentionality
Reciprocity
Meaning P
Meaning R
Transcendence
Feeling of competence
Regulation and control...
Resource management